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United States Naval Academy

Catalogue

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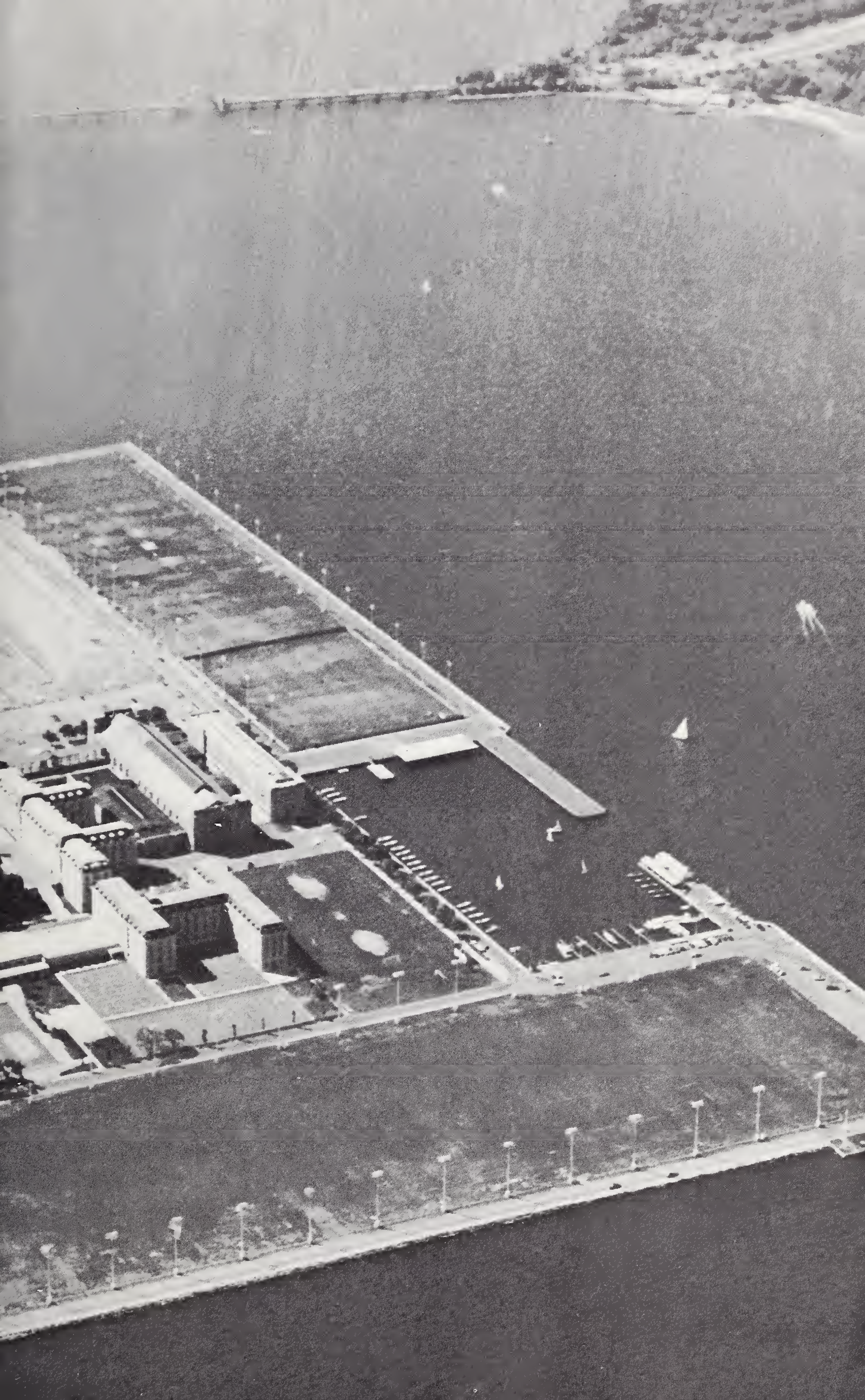
To develop midshipmen
morally, mentally
and physically
and to imbue them
with the highest ideals
of duty, honor
and loyalty
in order to provide graduates
who are dedicated
to a career of Naval Service
and have potential for
future development
in mind
and character
to assume the highest
responsibilities
of command, citizenship
and government.

THE MISSION OF THE UNITED STATES NAVAL ACADEMY



Gentlemen

Each of you is faced with the problem of determining what to do with your lives after graduation from high school. As you look over this catalogue I would ask you to give serious consideration to what Annapolis has to offer you—and to the possibilities for service to your nation that it opens to you. The education offered by the Naval Academy today is one of the finest in the nation. It is flexible, of high quality, and is conducted in one of the finest physical plants in the United States.

But Annapolis offers much more than an education. It provides training in leadership which will stand you in good stead throughout your life and it is dedicated to the inculcation of those characteristics of manliness, duty, and honor which have always been associated with service to our nation on the highest level.

Annapolis offers you a sophisticated and advanced education, tailorable to many of your individual wishes and aptitudes—but much more important, it is dedicated to developing within its graduates an understanding of what it means to be a competent and conscientious professional officer. I can assure you from personal experience that it is as exciting, varied, and rewarding a career as is open to the young men of America anywhere today. I recommend that you give it your careful consideration.

James Calvert

James Calvert
Rear Admiral, U.S. Navy
Superintendent

Contents

The Naval Academy/**1**
How to Become a Midshipman/**9**
The Naval Officer's Career/**47**
The Academic Program/**57**
The Military and Professional Program/**73**
Religious Activities/**91**
Life of a Midshipman—A Pictorial/**94**
Academic Departments and Programs/**99**
Professional Training/**191**
The Athletic Program/**199**
The Extracurricular Program/**207**
Sailing/**208**
The YP Squadron/**210**
Administration/**213**
Staff and Faculty/**217**
Prizes and Awards/**245**
The Museum/**245**
Naval Academy Alumni Association/**245**
The United States Naval Institute/**246**
Calendar/**247**
Index/**248**

The Naval Academy

The U.S. Naval Academy is the undergraduate college of the U.S. Navy. Its purpose is to educate and train young men for careers as officers in the Naval Service. The Academy is accredited by the Middle States Association of Colleges and Secondary Schools. Graduates of its four-year course are awarded the Bachelor of Science degree and are commissioned ensigns in the U.S. Navy or second lieutenants in the U.S. Marine Corps.

Located at the mouth of the Severn River on Chesapeake Bay in Annapolis, historic Colonial capital of Maryland, the Academy is 30 miles east of Washington, D.C., and 25 miles south of Baltimore. Visitors are welcome during daylight hours. Information and a map of the Academy are available at the entrance gates.

Through the Years, 1845–1969

As the Nation's responsibilities and need for seapower have grown through the years, the Navy has increased greatly in size and complexity. Keeping pace, in peace and war, from sail to steam, and into the nuclear age, the Naval Academy has responded to every challenge, expanding its facilities and revising its curriculum as necessary to provide the timely second-to-none leadership expected of the American Navy.

The Naval Academy was founded as the Naval School in 1845 by the Honorable George Bancroft, distinguished historian and educator and Secretary of the Navy in President Polk's Cabinet. Its site, Fort Severn, was obtained from the War Department. The first Superintendent was

Commander Franklin Buchanan. His seven-member faculty of four officers and three civilians taught gunnery, naval tactics, engineering, chemistry, mathematics, astronomy, French, and English. Sixty midshipmen, formed in two classes, attended the Academy's first convocation.

Prior to 1845, the majority of a midshipman's training was conducted aboard ship under the ship's chaplain. Supplementary training was provided from time to time at various schools ashore. These included a short-lived school in the Washington Navy Yard, established in 1803, and a Naval School established in Philadelphia in 1839 to provide an eight-month preparatory course for midshipmen's promotion examinations.

Initially the course was five years. Of these, only the first and last were spent at the new Naval School at Annapolis. The intervening three were spent at sea. In 1850–51 the Naval School was reorganized as the U.S. Naval Academy and the course of study became four consecutive years. Summer practice cruises replaced the omitted sea service. Thus, today's basic four-year curriculum first appeared at the Naval Academy over 100 years ago, long before it became general practice in American undergraduate education.

The Naval Academy

The Board of Visitors first met at the Academy in 1851. During the Civil War the Academy was moved temporarily to Newport, R.I. Following the war it was returned to Annapolis, where it has since remained. During these early years the Academy was unique in American educational experience in that it was one of the few institutions offering a sophisticated undergraduate course in technical education. In 1879 this excellence was recognized by the Paris Exposition in the form of a certificate for "The Best System of Education in the United States."

In the late 1870's Albert A. Michelson, a graduate of the Class of 1873, performed his world-famous experimental measurement of the velocity of light while serving as an instructor in the Department of Physics and Chemistry at the Academy. Michelson continued his brilliant scientific work after leaving the Navy, and in 1907 he became the first American scientist to receive a Nobel Prize. The supreme compliment was paid by Albert Einstein who once noted that the inspiration for his theory of relativity came directly from Michelson's work. Thus, it comes as no surprise to note that the name selected for the science wing of the Academy's recently completed science and mathematics building is Michelson Hall.

Other distinguished graduates have included Mahan, whose profound writing on seapower and its influence on history is still the world standard in its field, and an uninterrupted succession of distinguished military leaders going back through peace and war for over 100 years. Admirals Dewey, Sims, King, Nimitz, Halsey, Burke, and Rickover need no introduction. Neither do astronauts Shephard, Schirra, Lovell, Anders, and Stafford. The successors and heirs to their greatness are midshipmen today.

From 1873 to 1912 the academic course was six years, with the last two being spent at sea. In 1912 the requirement for two years at sea was eliminated and the curriculum reverted to four years. With the exception of temporarily shortened curriculums during the war years, it has remained four years until today.

Following accreditation of the Naval Academy in 1930 by the Association of American Universities, a 1933 congressional law was passed authorizing the Academy to confer the Bachelor of Science degree upon all graduates, beginning with the Class of 1931. Subsequently, in 1939, Congress authorized the award of the B.S. degree to all living graduates. The Middle States Association of Colleges and Secondary Schools first accredited the Academy in 1947. And, in 1958, the tests of the College Entrance Examination Board replaced Academy-prepared entrance examinations.

In 1964 the Academy's Ph.D. Program was instituted under which highly qualified midshipmen may be selected to go directly to graduate studies leading to a Ph.D. degree. Other programs initiated in recent years include nuclear power training and a number of graduate programs. The most recent, initiated in the fall of 1966, is the Immediate Graduate Education Program under which qualified midshipmen may be selected to enroll in accelerated master's programs immediately after graduation at participating universities or at the Naval Postgraduate School. Also in 1966, an Academic Advisory Board of distinguished Americans was appointed by the Secretary of the Navy to advise the Superintendent on academic matters. The Board meets three times each year.

Highlighted by a record six Rhodes Scholarships in 1930, midshipmen have won an impressive number of academic honors through the years. Two of the ten Churchill Scholarships awarded in the U.S. in 1966 were awarded to Academy graduates. In all, midshipmen of the Class of 1968 were awarded 29 top scholarships, including one Rhodes, five Atomic Energy Commission, one National Science Foundation, eight Guggenheim, ten Burke, one Daedalian, and three awarded by Catholic University. Eighty-one midshipmen were selected for the Navy's Immediate Graduate Education Program.

The Naval Academy's debate team has had a consistently fine record in recent years. Highlight was a national ranking of fourth in 1964. During the most recently completed season, the team participated in 30 tournaments, winning 19 awards.

Midshipmen have displayed an active and growing interest in the study of international affairs. Last spring, 160 students from more than 100 schools attended the Academy's eighth annual Foreign Affairs Conference. High State Department officials as well as ambassadors and representatives from 20 embassies took part.

Recent Curriculum Changes

The rush of science and technology in recent years has spurred revolutionary changes in the Navy and in the Academy's curriculum. Discussed in greater detail on succeding pages, these changes began in 1959 with provision for incoming midshipmen to validate previous college-level work. Concurrent with validation, there was a broadening of course offerings and qualified midshipmen were encouraged to carry more than the minimum number of courses.

This was followed in 1963 by the appointment of a civilian Academic Dean (pro tem); the initiation of the Trident Scholar program, under which a small number of exceptional students are permitted to pursue independent research during their First Class (senior) Year; and the conversion of the Academy's traditional 4.0-based marking system to the more widely used letter-grade system.

The 1964–65 Academic Year saw the establishment of the civilian line positions of Academic Dean and Dean of Admissions under the Superintendent. Academic departments were placed directly under the Academic Dean. Far-reaching changes made in the curriculum at this time followed logically the provisions for validation, electives, and "overloads" initiated in 1959.

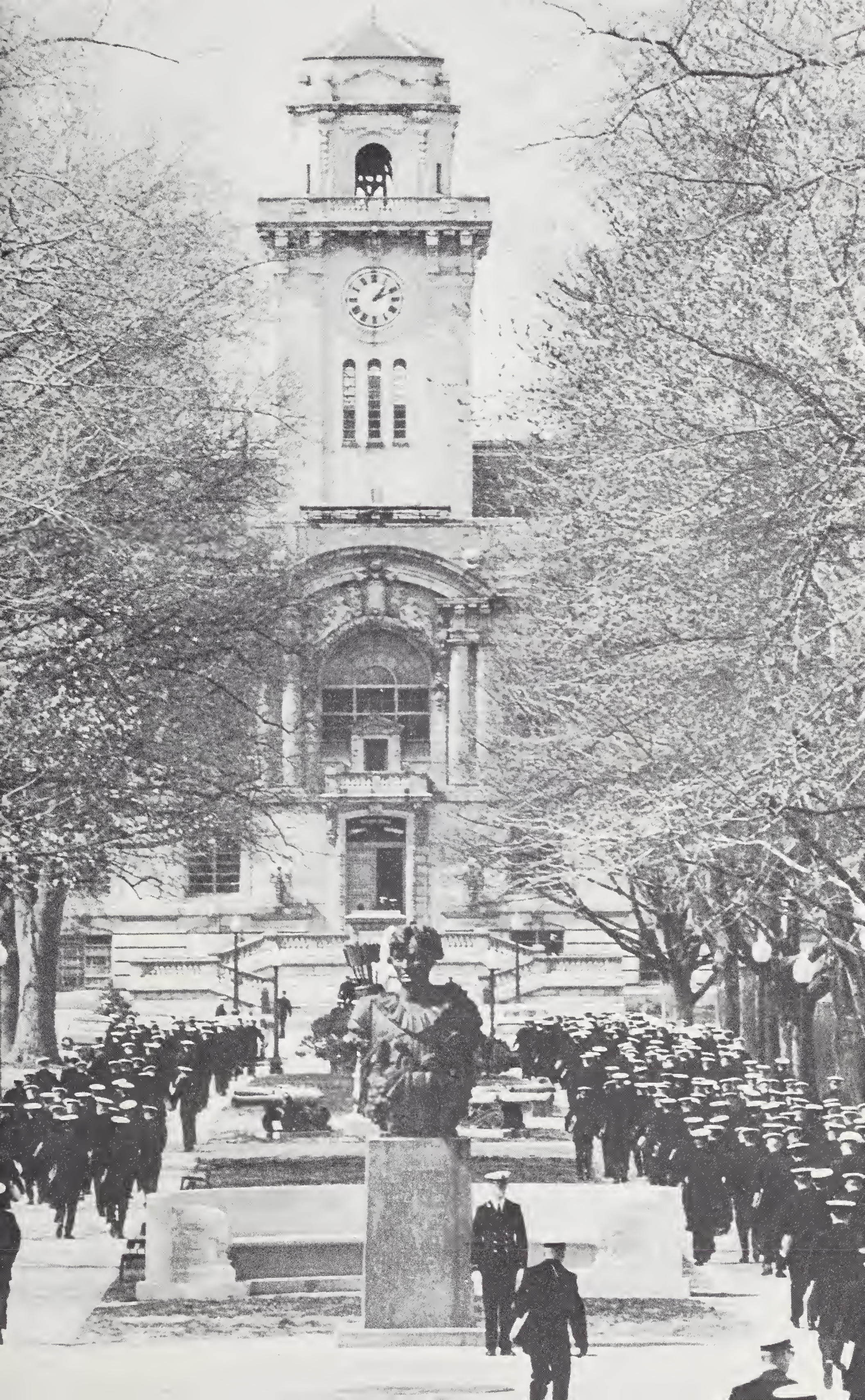
The Academy's traditionally uniform basic curriculum gave way to a flexible curriculum of core courses and an elected six-course minor. Twenty-three minors and 21 (now 23) majors were offered. Study in greater depth was facilitated by a reduction in formal course requirements and by an increase in the number and depth of elective courses offered. The Class of 1968 was the first to enter the Academy under this new program.

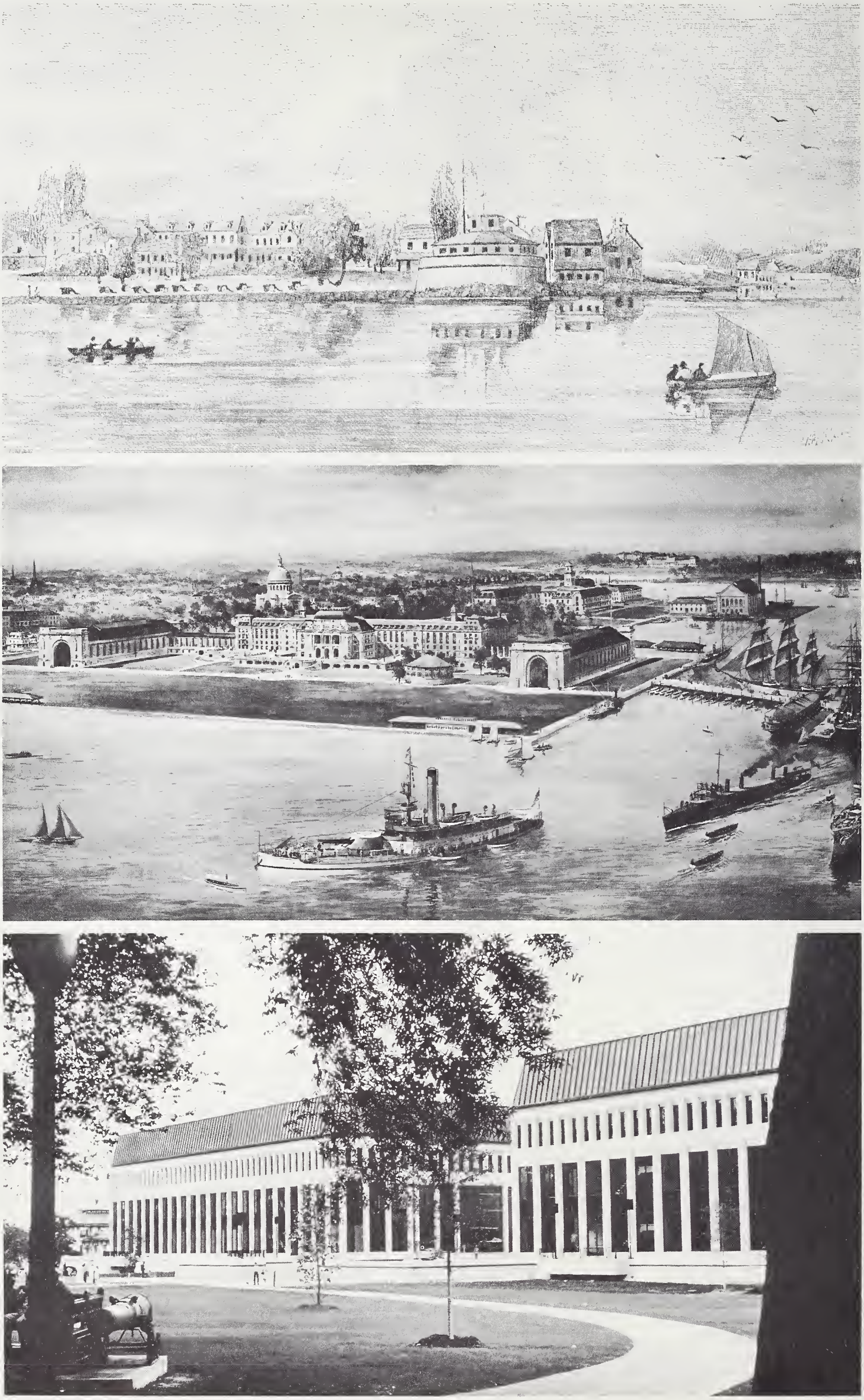
Most recently, in the fall of 1967, the basic curriculum was strengthened by the addition of certain core courses in the military-professional area. Some of this additional work is scheduled during the summer.

Increasing numbers of midshipmen have taken advantage of the flexibility offered by the Academy's validation and elective programs to pursue advanced undergraduate study. Members of the most recent entering class validated more than 2,000 courses, while over 200 members of the last graduating class fulfilled requirements for one or more majors.

Facilities

Physical and academic facilities have kept pace with the demands of the curriculum and the Fleet. Fort Severn's original 10 acres have grown to today's 302 acres. Much of this increase has resulted from a series of landfills in the Severn River. The most recent landfill, completed in 1959, added 56 acres for athletic fields and new buildings. Construction of buildings in French Renaissance style began in 1899 with a Congressional appropriation of $10 million. The renowned





Naval Academy 1853 and 1908. Michelson and Chauvenet Halls, completed 1968.

Ernest Flagg was the architect.

Recent years have seen the addition of new wings to Bancroft Hall, the midshipmen's dormitory; the construction of a new Brigade Library and Assembly Hall; the construction of a new athletic field house, large enough to accommodate the entire 4,200-man Brigade of Midshipmen with families and friends of First Classmen (seniors) when used at graduation; and the construction, with privately donated funds, of the nearby Navy-Marine Corps Memorial Stadium. A complete multimillion-dollar renovation of six of Bancroft Hall's eight wings was completed in 1965.

Currently, a $73-million construction and rehabilitation plan is underway. Key structures in this plan are the new science building, Michelson Hall and, adjoining, a new mathematics building, Chauvenet Hall. Both were completed in the summer of 1968. A new engineering building and laboratory complex, a new 750,000-volume library, and a new 2,500-seat multi-purpose auditorium are scheduled. A full range of facilities and services for student and faculty research, computer-aided education, and educational television will be provided throughout the academic complex. All academic areas will be air-conditioned.

The center of midshipmen activity in today's Yard is Bancroft Hall, the largest and surely one of the most beautiful dormitories in the world. Stretching over many acres, and so large that it must be viewed from the air to be seen in its entirety, it houses all of the Brigade as well as providing facilities for recreation and basic daily needs.

Sharing the spotlight in the Yard is the tall, beautiful, and familiar Chapel dome, beneath which lies the crypt of America's renowned Revolutionary War hero, John Paul Jones. Throughout the Yard stand other monuments and mementos commemorating great men and deeds of our Navy and perpetuating its traditions.

How to Become a Midshipman

Candidates for Admission Must

Meet general eligibility requirements
Obtain a nomination
Qualify scholastically
Qualify medically

General Eligibility Requirements

CITIZENSHIP. All candidates for admission to the U.S. Naval Academy must be male citizens of the United States, except as provided by law for limited numbers of citizens of other American Republics and the Philippine Republic.

AGE. Candidates must be at least 17 and not have passed their 22nd birthday on 1 July of the year of admission.

MARRIAGE. Candidates must never have been married. Any midshipman who marries will be discharged from the Academy.

MORAL CHARACTER. Candidates must be of good moral character.

Obtaining A Nomination

GENERAL. U.S. citizens are appointed to the Naval Academy without regard to race, creed, or national origin. It is necessary for a young man to obtain a nomination in order to be considered for appointment. The sources of nominations are described below. The applicant should study the various sources carefully to determine those through which he is eligible to apply.

Types and Sources of Nominations

CONGRESSIONAL. Each Senator, each Representative, and the Resident Commissioner of Puerto Rico individually may have a maximum of five midshipmen attending the Naval Academy at any one time. The applicant should address his request directly to the official concerned. It is not necessary to know the Congressman personally in order to apply. Eligibility for congressional nominations is restricted by law to the two Senators from an individual's home state and to the Representative of the congressional district in which he lives. A sample letter of application is included on page 16.

VICE PRESIDENTIAL. The Vice President may have a maximum of five midshipmen attending the Naval Academy at any one time. He may nominate candidates from the United States at large. A letter requesting nomination should be addressed directly to the Vice President. It should contain the same information required of a congressional applicant.

DISTRICT OF COLUMBIA. The Commissioner of the District of Columbia may have a maximum of five midshipmen attending the Naval Academy at any one time. Applications should be made directly to the Commissioner. A letter requesting nomination should contain the same information required of a congressional applicant.

THE GOVERNORS OF PUERTO RICO AND THE CANAL ZONE may each have one midshipman attending the Naval Academy at any one time.

THE GOVERNORS OF THE VIRGIN ISLANDS, GUAM, AND AMERICAN SAMOA may, collectively, have one midshipman attending the Naval Academy at any one time. Applications to these nominating authorities should contain the same information required of congressional applicants.

PRESIDENTIAL. The President may appoint 100 midshipmen each year. These appointments are limited by law to sons and adopted sons of officers and enlisted personnel, Regular or Reserve, of the Army, Navy, Air Force, Marine Corps, or Coast Guard who either (1) are on active duty (other than for training) and have served continuously on active duty for at least eight years, or (2) are retired, or who died while they were retired with pay or granted retired or retainer pay, other than those granted retired pay under Section 1331 of Title 10, USC.[1]

A person who is eligible for selection in the Sons of Deceased/Disabled Veterans category is not eligible in the Presidential category.

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[1] Retirement under this law provides for retirement at age 60 for combined active and inactive service of at least 20 years.

Adopted sons must have been adopted prior to their 15th birthday. The Secretary of the Navy is authorized to approve waivers of this policy where adoption proceedings had been initiated but the adoption had not occurred prior to the 15th birthday through circumstances beyond the control of the foster parents. Stepsons are not eligible. Applications should be addressed to the Chief of Naval Personnel, Department of the Navy, Washington, D.C. 20370. A sample letter of application is included on page 17.

REGULAR NAVY AND MARINE CORPS. The Secretary of the Navy may appoint 85 enlisted men of the Regular Navy and Marine Corps to the Naval Academy each year. These men must meet all of the entrance requirements and may not have passed their 21st birthday as of 1 July of the year of entrance to the Naval Academy. Applicants must have enlisted in the Navy or Marine Corps prior to 1 July of the year preceding the desired year of entrance to the Naval Academy. Applicants from the Regular Navy and Marine Corps normally attend the Naval Academy Preparatory School in order to compete for these appointments. Since the selection of candidates for this school begins in the spring, enlisted men who fulfill the age and service requirements are encouraged to make their desires known to their commanding officers as early in the year as possible.

NAVAL RESERVE AND MARINE CORPS RESERVE. The Secretary of the Navy may appoint 85 enlisted men of the Naval Reserve and Marine Corps Reserve each year. These men must be qualified as to age and must have enlisted in the Reserve prior to 1 July of the year preceding the year of entrance to the Naval Academy. In addition to all other normal requirements for appointment, these men must be on active duty, or must be members of a drilling unit of the Reserve, be recommended by their commanding officers, and have maintained efficiency in drill attendance with their Reserve units. The Naval Academy Preparatory School has a limited number of openings available each year for applicants from the Reserve.

Midshipmen USNR of the Regular NROTC Program and members of the Aviation Cadet Program are not eligible for appointment under this quota.

For further information about enlistment in the Naval Reserve or Marine Corps Reserve, applicants should apply to their nearest Naval or Marine Corps Reserve Training Center or Naval Recruiting Station.

SONS OF DECEASED OR DISABLED VETERANS. The President may have a maximum of 40 midshipmen attending the Naval Academy at any one time who are sons of deceased or disabled veterans.

Eligibility for nomination under this quota is limited to sons of members of the Armed Forces of the United States who were killed in action or died of, or have a service-connected disability rated at not less than 100 per centum resulting from, wounds or injuries received

or diseases contracted in, or preexisting injury or disease aggravated by active service.

The determination of the Veteran's Administration as to service connection of the cause of death or percentage of disability is binding upon the Secretary of the Navy. A sample letter of application is included on page 18.

HONOR NAVAL AND MILITARY SCHOOLS. The Secretary of the Navy may appoint annually 10 honor graduates of educational institutions designated as "honor schools" by the Department of the Army, Navy, and Air Force. Each honor school may nominate three honor graduates to compete for these appointments. Included in the three may be students who are expected to be honor graduates in June of the year of admission to the Academy. However, these nominees will not be considered for appointment unless they subsequently fulfill the requirements enabling them to be honor graduates at the time of their graduation. Eligible students should apply to the heads of their schools for nomination.

NAVAL RESERVE OFFICERS' TRAINING CORPS. The Secretary of the Navy may appoint 10 midshipmen annually from among members of the Naval Reserve Officers' Training Corps. Three candidates may be nominated each year by the Professor of Naval Science of each educational institution in which an NROTC unit is established. Each candidate must have completed one year of scholastic work in the Corps at the time of entrance to the Naval Academy.

SONS OF MEDAL OF HONOR WINNERS. The sons of persons awarded the Medal of Honor may be appointed, provided they are in all other respects qualified. No recommendation or endorsement from any source is required. Applications for these appointments should be addressed to the Chief of Naval Personnel, Navy Department, Washington, D.C. 20370.

Qualified Alternates and Competitors

GENERAL. The Secretary of the Navy is authorized to appoint 150 qualified congressional alternates. These appointments are awarded to the best-qualified alternates as recommended by the Academic Board of the Naval Academy.

Additional appointments from qualified alternates and competitors may be made by the Secretary to bring the Brigade of Midshipmen to its authorized strength. If these additional appointments are necessary, at least 75 percent must be selected from congressional nominees. The remainder may be made from noncongressional sources. The qualifications of all qualified alternate and competitive candidates will be carefully evaluated. No special application for these appointments by the individual is necessary or desired.

Foreign Students

REPUBLIC OF THE PHILIPPINES. On behalf of the President of the United States, the Secretary of the Navy is authorized to permit up to four Filipinos at a time to receive instruction at the Naval Academy. Applications for these appointments must be addressed through diplomatic channels. The appointments are on a competitive basis.

AMERICAN REPUBLICS OTHER THAN THE UNITED STATES. Upon designation by the President of the United States, the Secretary of the Navy is authorized to permit up to 20 persons at a time from foreign American Republics to receive instruction at the U.S. Naval Academy. Not more than three persons from any one country may receive instruction at the same time. Applications for these appointments must be addressed through appropriate diplomatic channels. The appointments are on a competitive basis.

Nominating Methods

CONGRESSIONAL. Members of Congress may nominate by either of the following methods:

Principal-Alternate Method

The Congressman may nominate one principal candidate and nine alternate candidates listed in order of his preference. If the principal candidate meets the eligibility criteria and qualifies on the entrance examinations, he will be offered the appointment. If he does not, the next designated alternate candidate who qualifies will be chosen.

Competitive Method

The Congressman may nominate a maximum of ten competitors for each vacancy. In evaluating these candidates for the Congressman, the Academy analyzes the "whole man," assigning appropriate weighted values to several factors, including examination scores, previous academic work, extracurricular activity, participation in sports, the holding of class office, and the recommendations of principals and teachers. The candidate with the best whole-man composite score is offered the appointment.

OTHER CATEGORIES. The choice between the Principal-Alternate and Competitive Methods is also available to the District Commissioner and the Governors of Puerto Rico and the Canal Zone. The Governors of the Virgin Islands, Guam, and American Samoa must nominate by the Competitive Method in selecting the nominee for their one common appointment.

Candidates are selected for appointment on a strictly competitive basis from nominees entered in the several service-connected cate-

Candidate discussing his qualifications with the Dean of Admissions

gories: Presidential, Sons of Deceased or Disabled Veterans, Regular and Reserve Components, Honor Military and Naval Schools, and NROTC. Factors considered in evaluating these nominees are the same as those discussed in the Competitive Method "whole man" analysis used for the evaluation of congressional candidates. There is no limit on the number of eligible candidates who may compete in the Presidential, Sons of Deceased or Disabled Veterans, or Regular and Reserve categories.

NOMINATING SCHEDULE. A candidate is advised to apply early for nomination. If seeking a congressional nomination, it is particularly important to apply early, *preferably during the spring of the junior year in high school.* Senators and Representatives may submit the names of their nominees any time between 1 July 1969 and 31 January 1970 for the class entering in June 1970. A majority of them will make their selections for nominations early in this period. It is, of course, too late to apply once the Congressman has selected his quota of nominees.

In any case, all nominations from all sources must be received by 31 January 1970 for the class entering in June 1970.

Requesting A Congressional Nomination

Date

Honorable ------------ OR Honorable ------------
House of Representatives OR United States Senate
Washington, D.C. 20515 OR Washington, D.C. 20510

Dear Mr. ------------: Dear Senator --------:

It is my desire to attend the United States Naval Academy and to make the United States Navy my career. I respectfully request that I be considered as one of your nominees for the class that enters the Academy in June 1970.

The following personal data are furnished for your information:

Full Name: (As recorded on birth certificate)

Address: (City, County, State)

Name of Parents:

Date of Birth:

High School Attended:

Date of High School Graduation:

Approximate Grade Average:

My high school transcript of work completed to date is attached.

I have been active in the high school extracurricular activities described on the attached list.

I shall greatly appreciate your consideration of my request for nomination to the U.S. Naval Academy.

Sincerely yours,
Signature

Requesting A Presidential Nomination

Date

Chief of Naval Personnel
Department of the Navy
Washington, D.C. 20370
ATTN: Pers–B66

Dear Sir:

I request a nomination under the Presidential category for the class that enters the Naval Academy in June 1970 and submit the following information:

Full Name: (Give name as shown on birth certificate. If different from that which you use, attach a copy of court order, if applicable)
Address: (Give permanent and temporary address)
Date of Birth: (Spell out month)
Date of High School Graduation:
If Member of Military: (List rank, serial number, component, branch of service, and organizational address)
If Previous Candidate: (List year)

Information on Parent:

Name, Rank, Serial Number, Component, and Branch of Service:
Organizational Address:
Retired or Deceased: (Give date and attach copy of retirement orders or casualty report)
Officer Personnel: (Attach statement of service prepared by personnel officer specifying that officer is on active duty and has been on active duty for at least eight years)
Enlisted Personnel: (Attach statement by personnel officer listing dates of enlistment and expiration of enlistment, component and branch of service, and specifying that member is on active duty and has been on active duty for at least eight years)

Sincerely yours,
Signature

Requesting Son of Deceased/Disabled Veteran Nomination

Date

Chief of Naval Personnel
Department of the Navy
Washington, D.C. 20370
ATTN: Pers–B66

Dear Sir:

I request a nomination under the Sons of Deceased/Disabled Veterans category for the class that enters the Naval Academy in June 1970 and submit the following:

Full Name: (Give name as shown on birth certificate. If different from that which you use, attach a copy of court order, if applicable)
Address: (Give permanent and temporary address)
Date of Birth: (Spell out month)
Date of High School Graduation:
If Member of Military: (List rank, serial number, component, branch of service, and organizational address)
If Previous Candidate: (List year)

Information on Parent:

Name, Rank, Serial Number, Component and branch of Service:
If Parent is Deceased:
Date, Place, and Cause of Death:
Veterans Administration Claim Number: (Forwarding a copy of death certificate, preferably the casualty report, will expedite processing of application)
Address of VA Office where case is filed:
If Parent is 100% Disabled:
Veterans Administration Claim Number, and copy of retirement order or other documentary evidence showing 100% service-connected disability:
Address of VA Office where case is filed:

Sincerely yours,
Signature

CIVIL SERVICE COMMISSION EXAMINATIONS FOR CONGRESSIONAL NOMINATIONS. Some Congressmen and other authorized nominators utilize competitive examinations of the U.S. Civil Service Commission to assist them in evaluating and selecting their candidates. These special competitive examinations do not determine the candidate's scholastic qualifications for admission to the Naval Academy. The Naval Academy requirements must still be met fully.

Scholastic Requirements

A candidate's previous academic record and his performance on specified College Entrance Examination Board tests are the factors used to determine scholastic qualification for admission. The results of any College Board test taken to qualify for the Naval Academy are applicable to all nominations which a candidate may hold. Acceptable test dates are noted on the pages following.

There are two methods of qualifying scholastically for admission to the Naval Academy: the Examination Method and the College Certificate Method. These two methods are described on succeeding pages.

SUBMISSION OF SCHOLASTIC RECORDS. Each candidate is responsible for ensuring the submission of detailed records of his completed high school, preparatory school, and college work as well as lists of any current or proposed courses. The official college transcript should be used for submitting college records.

Official forms for submitting high school records will be provided by the Navy Department following receipt of the nomination from the Member of Congress or other authorized appointment source. These certificates should be filled out and submitted to the Naval Academy by the school or schools as soon as practicable after receipt. It is important to each candidate that records be supplied promptly and that previous school records include academic marks and class standing or estimated class standing through the first semester of the final year. In the event that class standing for the end of the junior year is the latest available, it will be acceptable. Recommendations from the candidate's high school principal, teachers, extracurricular advisers, and coaches should be furnished on the forms provided. These records and recommendations are considered in conjunction with the College Entrance Examination Board tests in order to establish the relative priority of qualified candidates in the various competitive lists and for the purpose of selection under the qualified alternate law. They must be received not later than 15 March, 1970.

It must be appreciated that, except for qualified congressional principals and qualified sons of Medal of Honor holders (who receive outright appointments), all candidates who have succeeded in qualifying scholastically, medically, and physically must be evaluated and arranged in order of precedence. The method utilized by the Academy to determine the relative merit of these qualified candidates is the "whole man" analytical process described previously under the Competitive Method on page 14.

Once candidates have been fully evaluated and assigned an appropriate numerical selection score, and their names placed on a master list in order of their scores, their relative positions on the list do not change. Thus the single master list serves to determine a candidate's relative position on any competitive list for which he is eligible.

ACCEPTABLE SCHOLASTIC RECORD. Each candidate must present an acceptable secondary school certificate from an accredited secondary school, or its equivalent, including at least 15 units of credit in college-preparatory subjects and indicating ability to do college-level work successfully. While not an absolute requirement, standing in the top 40 percent of one's high school class is of great importance in determining qualification for admission. (The great majority of midshipmen come from the top 20 percent of their high school classes.) Candidates should, insofar as is practicable, include as many as possible of the following studies in their secondary school programs:

☐ At least three years but preferably four years of mathematics, including advanced algebra, geometry, and trigonometry.

☐ Four years of English.

☐ Two years of a foreign language, preferably modern.

☐ One year of chemistry.

☐ One year of physics.

It is expected that the secondary school official will recommend only those candidates who, in his opinion, have excellent character and the scholastic background needed to pursue a difficult college-level course in which the emphasis is placed on engineering subjects as well as the humanities.

Deficiencies in the secondary school certificate can often be offset by offering acceptable college work. Conversely, evidence of inability to do acceptable college work can be cause for disqualification.

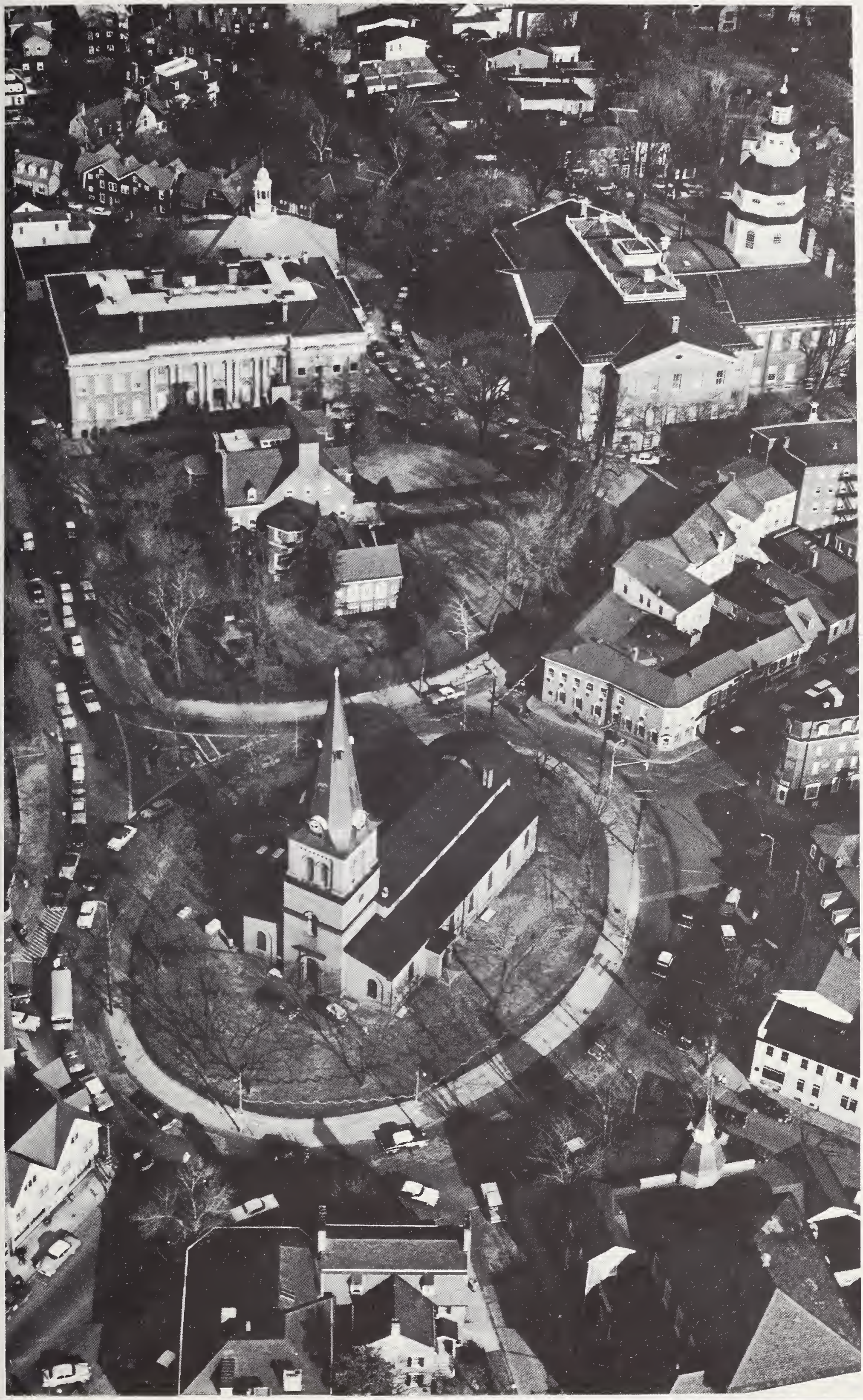
EXAMINATION METHOD. The basic method of qualifying is by presenting an acceptable secondary school certificate and by scoring acceptably in the following College Entrance Examination Board tests:

☐ Scholastic Aptitude Test (Verbal)

☐ Scholastic Aptitude Test (Mathematics)

☐ Achievement Test in English Composition

☐ Achievement Test in Mathematics, Level I (Standard) or Level II (Intensive)



View of Annapolis—the home of the Naval Academy

It is the candidate's responsibility to insure that he takes these required tests. No substitutes will be considered in qualifying for entrance to the U.S. Naval Academy. Candidates are encouraged to choose the mathematics achievement test on which they feel they can attain the higher score. Level I is recommended for candidates without advanced high school mathematics. No additional weight is given to the results of the test in Level II Mathematics over those in Level I Mathematics.

A candidate must take the tests no later than March 1970. In 1969–70, the regular College Board testing dates are:

☐ Saturday, 1 November 1969 (SAT only)
☐ Saturday, 6 December 1969 (SAT and Achievement Tests)
☐ Saturday, 10 January 1970 (SAT and Achievement Tests)
☐ Saturday, 8 March 1970 (SAT and Achievement Tests)

Basic qualifying scores in the College Entrance Examination Board tests for any class will be determined by the Academic Board of the Naval Academy. No candidate will be admitted to the Naval Academy unless in the opinion of the Academic Board he shows the requisite scholastic qualifications.

Each candidate is responsible for registering with the College Entrance Examination Board for the tests. *The Naval Academy will credit a candidate with the highest scores achieved* in tests taken through March 1970. The candidate, however, must insure that the Naval Academy receives the results from all tests he has taken. He should indicate at the time he registers for the test that he wishes the scores furnished to the Naval Academy or, in the event he did not so indicate, he should write to the College Entrance Examination Board and request that his scores be furnished to the Naval Academy.

Candidates must pay for their own College Entrance Examination Board tests. A candidate who is unable to pay for such tests should promptly advise the College Board so that special arrangements may be made.

General information on the tests, including dates of administration, location of testing center, dates by which candidates must register, method of application, fees, etc., is published in a booklet entitled *Bulletin of Information*. This booklet, published annually by the College Board, may be obtained without charge by writing to:

The College Entrance Examination Board at

Post Office Box 592
Princeton, N.J. 08540

or

Box 1025
Berkeley, Calif. 94701

In addition to the above-mentioned *Bulletin*, the College Board publishes two other booklets, one entitled *A Description of the College Board Scholastic Aptitude Tests* and the other *A Description of the College Board Achievement Tests*. Supplies of these two booklets are provided by the College Board to all high schools. Candidates may obtain the booklets from their high schools or may write to the College Board for individual copies free of charge.

For the majority of candidates, the examining points are in the communities in which they live. It is expected that few, if any, candidates will have to travel more than 75 miles.

Duly nominated candidates who have registered for and are unable to complete the prescribed College Entrance Examination Board tests on or before the 8 March administration because of sickness, injury, weather, or other extenuating circumstances should promptly advise the Chief of Naval Personnel.

COLLEGE CERTIFICATE METHOD. A candidate who holds a nomination as a Congressional, District of Columbia, or Vice Presidential principal or alternate, or who is seeking admission as the son of a Medal of Honor winner, may fulfill the scholastic requirements for admission by submitting an acceptable secondary school certificate and an acceptable college certificate. He is also required to take the College Entrance Examination Board tests specified above for the information of the Naval Academy.

A candidate competing under any source of nomination other than those outlined in the previous paragraph *must* qualify by the Examination Method; this includes all Congressional candidates nominated by the Competitive Method. All candidates planning to use the College Certificate Method should advise the Dean of Admissions, U.S. Naval Academy, of their intent to do so *prior* to 15 March 1970.

An acceptable college certificate is one attesting at least one year's attendance at an accredited junior college, college, university, or technical institution of college grade during which the candidate completed courses totaling at least 24 semester hours of credit for subjects acceptable to the Naval Academy with grades substantially better than the college minimum passing grade. Six semester hours must be in pure mathematics, such as college algebra, trigonometry, analytical geometry, calculus, etc., and six semester hours must be in English or history, or a combination thereof. The remaining credits necessary to complete the certificate may be offered from a wide range of college liberal arts or engineering subjects. The overall quality of the college record must be acceptable to the Naval Academy.

The length of college attendance prescribed is defined as requiring actual full-time attendance for one regular school year during which the candidate pursues courses constituting a normal year's load.

A candidate who contemplates qualifying by the College Certificate Method, but who has not completed the required year of college at the time of receipt of his nomination, should have his high school record and a preliminary college record submitted showing the courses contemplated or in progress and the amount of credit in semester hours to be assigned for each course. A form for submitting the high school record will be provided by the Navy Department. The official transcript form of the college should be used for submitting the college record. An early review by the Naval Academy of the record of completed work and of courses proposed for completion may reveal defects which can be corrected by slight changes in the final semester schedule. Following this review, the Naval Academy will forward a letter suggesting any steps which the candidate should take. If in doubt, a candidate should address a letter to the Dean of Admissions, U.S. Naval Academy, Annapolis, Md. 21402.

QUALIFYING IN PREVIOUS YEAR. Former midshipmen who have successfully completed the first year of the Naval Academy's course need not requalify scholastically for admission, but they must demonstrate to the satisfaction of the Academic Board that they are qualified for readmission. All other former candidates must requalify scholastically and medically for the class to which they seek admission.

Medical Qualification

Candidates are required to be physically fit, well-formed, and of sound constitution. The medical requirements are exacting, thus protecting the best interests of the Government, the Navy, and the individual.

All candidates are encouraged to undergo thorough private medical and dental examinations using the special medical examination considerations set forth herein (see page 27) as a guide in determining their medical and dental conditions before pursuing nomination and before taking the Qualifying Medical Examination. This will serve to identify obviously disqualified applicants as well as those who may have remedial defects. Defects must be corrected at the candidate's expense. The candidates who are obviously disqualified will benefit themselves and the U.S. Government by not pursuing candidacies further.

QUALIFYING MEDICAL AND PHYSICAL APTITUDE EXAMINATIONS. The Chief of Naval Personnel, Navy Department, Washington, D.C. 20370, will send an authorization designating the time and place of Qualifying Medical Examination to each duly *nominated* candidate. In addition, Members of Congress may arrange physicals for applicants seeking to qualify for nomination.

Qualifying Medical Examinations are conducted at more than 200 authorized Medical Examining Centers of the Army, Navy, and Air Force located throughout the United States and overseas. (See page 31 for a listing of these Centers.) The medical Examinations are standardized, and results are accepted by each of the three services, regardless of which service has conducted the examination. Examinations are conducted starting on 1 July of the year preceding admission.

The Qualifying Medical Examination includes a separate Physical Aptitude Examination. The Physical Aptitude Examination varies from service to service and may vary from year to year, but basically, for

Candidates enter from every state

all services, it includes sit-ups, pull-ups, push-ups, arm-hang, squat-walk, and related exercises. Tests given at Air Force and Army Examining Centers include evaluation of other areas. Examinations conducted by the other services are accepted by the Navy. Candidates reporting for examination should take sun glasses for use after eye examinations and shorts and athletic supporter for use during the Physical Aptitude Examination.

At Naval Examining Centers, the Physical Aptitude Examination is given in conjunction with all Qualifying Medical Examinations. It may be necessary to schedule Physical Aptitude Examinations separately for candidates examined at Army and Air Force Centers.

Candidates ordered to report for medical and Physical Aptitude Examinations, who are unable to report at the time scheduled, or who are injured or ill, or who, for any reason, are unable to comply with instructions to report for Medical and Physical Aptitude Examinations, must communicate with the Chief of Naval Personnel and the designated examining center to explain the circumstances before further examination will be authorized.

Candidates having orthodontic appliances in place are not required to have them removed prior to reporting for Qualifying Medical Examination. Candidates who have undergone major surgery involving knee, shoulder, or spine will not be scheduled for examination until six months have elapsed following surgery. Medical and Physical Aptitude Examinations will terminate on 15 March 1970. Injury and surgical cases will not be considered thereafter.

While candidates may be scheduled for Medical and Physical Aptitude Examinations at Army, Navy, or Air Force facilities, the majority of Naval Academy candidates will be scheduled for examination at Naval medical examining facilities. Condidates are expected to report prior to 7 a.m. on the day of examination except as may be otherwise directed in reporting orders. Normally, candidates examined at Naval medical examining facilities will be required to spend one day under examination. Candidates ordered to Army and Air Force Examining Centers will be required to spend two days to complete examinations.

Candidates are required to pay their own transportation, meals, berthing, and related expenses in connection with these examinations. *Generally, only one Medical and Physical Aptitude Examination will be authorized for each candidate.*

Qualifying Medical Examinations of candidates for the Academy receive prompt review by the Naval Academy's Permanent Board of Medical Examiners. Each nominated candidate is notified of the finding in his case by the Bureau of Naval Personnel. Candidates are advised to notify the Permanent Board at the Academy of any subsequent change in their physical condition requiring hospitalization or the service of a physician subsequent to their Qualifying Examination. Candidates reporting to the Academy for appointment as midshipmen with disqualifying medical defects will not be enrolled.

Review and Waiver Procedure

The results of all medical examinations of candidates for the Naval Academy are subject to review by the Permanent Board of Medical Examiners, US. Naval Academy. Medical qualification decisions made by that Board are final. In this respect, where the disqualifying defect is subject to medical or dental correction, the candidate may be conditionally rejected subject to later certification by a physician or dentist that the defect has been corrected with complete restoration of function. Such certification must reach the Permanent Board of Medical Examiners as soon as possible and not later than 15 March in any case. Final reports of applicants certified by that Board will be forwarded to the Chief of Naval Personnel and to the Academic Board, U.S. Naval Academy. *The Academic Board may grant waiver of a very minor defect to a candidate who is outstanding in all other respects.*

Since waiver action is predicated upon the overall quality of a candidate's record, it is important that transcripts of secondary school or college work, the report of extracurricular activities, and the required letters of recommendation be submitted as soon as possible. In some instances it will be necessary to delay evaluation of a record until results of the March College Board tests have been received. *It is emphasized that review and waiver procedures are* ***automatic*** *for all candidates who are found not medically qualified because of minor medical defects upon formal Qualifying Medical Examination and that queries regarding the status of waiver action will only delay final determination.* Reexamination of those candidates who fail the medical examination can be approved only by the Chief of Naval Personnel. Such reexamination will be authorized only in the most unusual instances.

Special Medical Examination Considerations

The following special medical examination considerations are set forth in order that candidates, prospective candidates, and their private physicians and dentists may have the basic medical requirements for entrance to the Academy readily available.

MEDICAL HISTORY. The medical history will be compiled with particular care, with elaboration where indicated. Inquiries will be made in detail concerning all illnesses, injuries, and operations which candidates may have incurred. Failure to fully document these items results in disappointment when medical disqualification is determined later. A history of familial diseases will be investigated thoroughly. If the candidate has received medical care which significantly affects his physical condition he will be required to submit evidence from attending physicians or from hospital records concerning this medical care. *A candidate who has defects which are remedial, including dental defects, should have them corrected prior to taking the Qualifying Medical Examination.*

WEIGHT STANDARDS

HEIGHT (inches)*	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
WEIGHT (pounds):															
Minimum	105	106	107	111	115	119	123	127	131	135	139	143	147	151	153
Maximum	183	187	191	196	202	208	214	219	225	231	237	243	248	254	260

**Waiver for height up to 80 inches may be granted to a limited number of candidates with exceptional scholastic and leadership achievements.*

These weight standards are necessarily arbitrary and waiver may be granted in unusual cases. For example, when a generally large bony structure and large well-distributed and proportioned muscle masses with little evidence of thick layers of subcutaneous fat account for the apparent excessive weight, the Permanent Board of Medical Examiners at the Naval Academy may recommend waiver consideration to the Academy's Academic Board. When weight is under the prescribed standards, if the skeletal structure is relatively slight but muscle development and strength are excellent, as manifested by demonstrable performance of physical aptitude tests and a history of athletic participation, similar action may be taken. Obesity is disqualifying.

EYES AND VISION: A cycloplegic refraction is required on all candidates. Unaided visual acuity of 20/20 is required. Waivers may be granted to a limited number of candidates with exceptional scholastic and leadership achievements whose vision is no worse than the following:

Either Eye	Other Eye
20/50	20/40
20/70	20/30
20/100	20/20

In addition, waivers may be granted to a very few candidates with outstanding qualifications whose vision is no worse than 20/100 in each eye. In all cases, the visual acuity must correct to 20/20 in each eye.

In the report of examination, the actual vision of each eye and the correction lens, if required, must be recorded. Excessive refraction errors are disqualifying. Both eyes must be free from any disfiguring or incapacitating abnormality and from acute or chronic disease. Candidates wearing contact lenses will remove them at least 72 hours prior to reporting for medical examination. Acceptable color perception is required. Results of color tests will reflect the name of the test, the number of plates correctly read, and the number of plates in the test, i.e., 14/17 etc. Use of a Farnsworth Lantern is required where available.

HEART AND VASCULAR SYSTEM: An electrocardiogram is required of all candidates. The following conditions may be causes for rejection and require complete medical evaluation: all organic valvular diseases of the heart, including those improved by surgery; EKG evidence of variations from normal heart beat; hypertension evidenced by predominant blood pressure reading of 140 mm or more systolic or 90 mm or more diastolic. The following are causes for rejection: varicose veins, if severe or symptomatic; heart rate greater than 100 on repeated examinations; substantiated history of rheumatic fever within the previous two years; recurrent attacks of rheumatic fever or evidence of residual cardiac damage; history of recurring rapid heart beat within the preceding five years (paroxysmal tachycardia).

EARS AND HEARING: Auditory acuity of all candidates will be determined by audiometer if available. Whispered voice at 15 feet right and left ear is acceptable if audiometric equipment is not available. Maximum acceptable hearing loss is indicated on the following chart:

FREQUENCY		250	500	1000	2000	3000	4000	6000	8000
		256	510	1024	2048	2896	4096	6144	8192
MAXIMUM loss in decibels	ASA Standards:								
	Better car	*	15	15	15	35	*	*	*
	Worse car	*	15	15	15	35	*	*	*
	ISO Standards:								
	Better car	*	25	25	25	45	*	*	*
	Worse car	*	25	25	25	45	*	*	*

*No requirement—record for baseline information only.

Both ears must be free from any disfiguring or incapacitating abnormality and from acute or chronic disease.

NARES: Septal deviation, hypertrophic rhinitis, or other conditions which result in 50 percent or more obstruction of either airway, or which interfere with drainage of a sinus on either side, are causes for rejection.

SKIN: Chronic skin diseases such as severe acne or eczema or unsightly congenital markings are cause for disqualification. Pilonidal sinus, if evidenced by presence of mass or discharging sinus, is cause for rejection.

SEROLOGIC TESTS: A serologic test for syphilis is performed on all candidates. An authentic history of syphilis of any type is cause for rejection without further laboratory procedure.

GENITOURINARY SYSTEM: Persistent or recurrent albuminuria of any type or the persistence of casts in the urine will be cause for rejection, even though the etiology cannot be determined. Other causes for rejection: marked phimosis, epispadias or pronounced hypospadias; atrophy, deformity, or maldevelopment of both testicles; or an undescended testicle of any degree. Bed wetting persisting into late childhood or early adolescence is cause for rejection.

NEUROLOGICAL EXAMINATION: A history of motion sickness (i.e., air, sea, swing, train, or carnival ride) should be thoroughly investigated. A history of head injury in the past five years resulting in unconsciousness must be completely evaluated and an electroencephalogram is required. Evidence of degenerative disorders and conditions such as established migraine are causes for rejection.

ASTHMA: Asthma, or recurrent asthmatic bronchitis by diagnosis or history since age 12, is cause for rejection.

ABDOMINAL WALL EXAMINATION: Hernia of any type is disqualifying until corrected; history of operation for hernia within past 60 days is disqualifying. Other abnormal diseases and conditions which are not acceptable include stomach or small bowel ulcer or history of same; acute or chronic gall bladder disease; history of removal of spleen for reason other than trauma.

MISCELLANEOUS MEDICAL FINDINGS THAT ARE DISQUALIFYING: Acute communicable diseases; anemia; abnormal bleeding states; diabetes mellitus or history of diabetes in both parents; persistent sugar in urine regardless of cause; ununited fractures; history of surgery to a major joint within past six months; history or derangement of knee joint not corrected by surgery, or evidence of instability subsequent to surgery; total loss of either thumb; tuberculosis, active in past five years; hay fever, if severe, or having undergone hyposensitization therapy for severe hay fever during the three years prior to examination; nasal polyps; personality disorders; symptomatic immaturity disorders such as stammering or stuttering; arthritis; and herniated nucleus pulposus or history of operation for this condition.

DENTAL STANDARDS: A candidate for appointment must have a minimum of 16 natural permanent teeth, of which a minimum of eight must be in each arch. All missing teeth causing unsightly spaces or significantly reducing masticatory or incisal efficiency must be replaced by well-designed bridges or partial dentures which are in good condition. Except for minor or questionable carious areas, all required dental treatment *must* be completed. Candidates undergoing active orthodontic treatment will be temporarily disqualified. Each such applicant will be considered on an individual basis by the Permanent Board of Medical Examiners at the Academy. Disqualifying defects are as follows:

☐ Lack of satisfactory incisal or masticatory function.

☐ Less than a minimum of eight natural permanent teeth in each arch.

☐ Edentulous spaces which are unsightly or which significantly reduce masticatory function.

☐ Carious teeth, except minor or questionable carious areas.

☐ Infectious or chronic diseases of the soft tissue of the oral cavity.

☐ Marked malocclusion resulting in severe dentofacial deformity.

☐ Unsatisfactory restorations, bridges, or dentures.

☐ Severe or extensive apical or periodontal infection.

☐ Perforations from the oral cavity into the nasal cavity or maxillary sinus.

☐ Tumors or cysts of the oral tissues which require treatment or may require treatment in the foreseeable future.

Medical Examining Centers

ALABAMA

Fort Rucker, Daleville
Maxwell AFB, Montgomery

ALASKA

Elmendorf AFB, Anchorage
USNAS, Adak
USNAS, Kodiak

ARKANSAS

Blytheville, AFB, Blytheville
Little Rock AFB, Jacksonville

ARIZONA

Davis-Monthan AFB, Tucson
Fort Huachuca, Cochise County
Williams AFB, Chandler

CALIFORNIA

Beale, AFB, Marysville
Castle AFB, Merced
Edwards AFB, Edwards
Fort Ord, Monterey
George AFB, Victorville
Hamilton AFB, Ignacio
Letterman Gen Hosp, San Francisco
March AFB, Riverside
Mather AFB, Sacramento
McClellan AFB, Sacramento
Travis AFB, Fairfield
NAS, Alameda
Naval Hosp, Camp Pendleton
NAF, El Centro
NAAS, Ream Fld, Imperial Beach
NAS, Lemoore
Naval Hosp, Long Beach
NAS, Los Alamitos, Long Beach
NAS, Moffett Field
NALF, Monterey
Naval Hosp, Oakland
Naval Missile Ctr, Point Mugu
MCAS, El Toro, Santa Ana
Naval Hosp, San Diego
NAS, North Island, San Diego
NAS, Miramar, San Diego
Vandenberg AFB, Lompoc

COLORADO

Fitzsimons Gen Hosp, Denver
Lowry AFB, Denver
USAF Academy

DELAWARE

Dover AFB, Dover

DISTRICT OF COLUMBIA

Andrews AFB
NAF Washington, Andrews AFB
Walter Reed Gen Hosp

FLORIDA

Elgin AFB, Valparaiso
Homestead AFB, Homestead
MacDill AFB, Tampa
Tyndall AFB, Panama City
NAS, Cecil Field
Naval Hosp, Jacksonville
NAS, Jacksonville
Naval Hosp, Key West
Naval Hosp, Pensacola
NAS, Sanford

GEORGIA

Fort Benning, Columbus
Fort Gordon, Groveton
Fort McPherson, Atlanta
Fort Stewart, Hinesville
Moody AFB, Valdosta
Robins AFB, Warner Robins
NAS, Atlanta
NAS, Glynco

HAWAII

Hickam AFB, Honolulu
Tripler Gen Hosp, Honolulu
USNAS, Barbers Point

IDAHO

Mountain Home AFB, Mountain Home

ILLINOIS

Chanute AFB, Rantoul
Fort Sheridan, Highland Park
Scott AFB, Belleville
Naval Hosp, Great Lakes
NAS, Glenview

INDIANA

Bunker Hill AFB, Peru
Fort Benjamin Harrison, Indianapolis

KANSAS

Fort Leavenworth, Leavenworth
Fort Riley, Junction City
McConnell AFB, Wichita
NAS, Olathe

KENTUCKY

Fort Knox, Hardin County

LOUISIANA

Barksdale AFB, Shreveport
England AFB, Alexandria
NAS, New Orleans

MAINE

Dow AFB, Bangor
Loring AFB, Limestone
NAS, Brunswick

MARYLAND

Fort George G. Meade, Odenton
NTC, Bainbridge
US Naval Academy, Annapolis
NAS, Patuxent

MASSACHUSETTS

Boston Army Base, Boston
Fort Devens, Ayer
Otis AFB, Falmouth
Naval Hosp, Chelsea
NAS, South Weymouth
Westover AFB, Chicopee Falls

MICHIGAN

Kincheloe AFB, Kincross
K. I. Sawyer AFB, Gwinn
Selfridge AFB, Mt. Clemens
NAS, Grosse Ile
Wurtsmith AFB, Oscoda

MINNESOTA

NAS, Minneapolis

MISSISSIPPI

Columbus AFB, Columbus
Keesler AFB, Biloxi
NAAS, Meridian

MISSOURI

Fort Leonard Wood, Waynesville
Richards-Gebaur AFB, Grandview
Whiteman AFB, Knob Noster

MONTANA

Glasgow AFB, Glasgow
Malmstrom AFB, Great Falls

NEBRASKA

Offutt AFB, Omaha

NEVADA

Nellis AFB, Las Vegas

NEW HAMPSHIRE

Pease AFB, Portsmouth
Naval Hosp, Portsmouth

NEW JERSEY

Fort Dix, Wrightstown
Fort Monmouth, Oceanport
McGuire AFB, Wrightstown
NAS, Lakehurst

NEW MEXICO

Cannon AFB, Clovis
Holloman AFB, Alamogordo
Kirtland AFB, Albuquerque

NEW YORK

Griffis AFB, Rome
Plattsburgh AFB, Plattsburgh
Stewart AFB, Newburgh
Beach, L. I.
Suffolk County AFB, Westhampton
U.S. Military Academy, West Point
NAS, New York
Naval Hosp, St. Albans, L. I.

NORTH CAROLINA

Fort Bragg, Fayetteville
Seymour Johnson AFB, Goldsboro
Naval Hosp, Camp Lejeune
MCAS, Cherry Point

NORTH DAKOTA

Grand Forks AFB, Mckinock
Minot AFB, Minot

OHIO

Lockbourne AFB, Columbus
Wright-Patterson AFB, Dayton

OKLAHOMA

Altus AFB, Altus
Clinton-Sherman AFB, Burns Flat
Fort Sill, Lawton
Tinker AFB, Oklahoma City

OREGON

Portland International Airport, Portland

PENNSYLVANIA

Carlisle Barracks, Carlisle
NAF, Johnsville
Naval Hosp, Philadelphia
NAS, Willow Grove
Valley Forge Gen Hosp, Phoenixville

RHODE ISLAND

Naval Hosp, Newport
Naval Stn, Newport
NAS, Quonset Point

SOUTH CAROLINA

Charleston AFB, Charleston
Fort Jackson, Columbia
Shaw AFB, Sumter
Naval Hosp, Beaufort
Naval Hosp, Charleston
MCAS, Beaufort

SOUTH DAKOTA

Ellsworth AFB, Rapid City

TENNESSEE

Fort Campbell, Clarkesville
Sewart AFB, Smyrna
NAS, Memphis

TEXAS

Amarillo AFB, Amarillo
Bergstrom AFB, Austin
Carswell AFB, Fort Worth
Dyess AFB, Abilene
Fort Hood, Killeen
Fort Sam Houston, San Antonio
Lackland AFB, San Antonio
Laughlin AFB, Del Rio
Perrin AFB, Sherman
Randolph AFB, San Antonio
Reese AFB, Lubbock
Sheppard AFB, Wichita Falls
NAAS, Beeville
Naval Hosp, Corpus Christi
NAS, Corpus Christi
NAS, Dallas
NAS, Kingsville
Webb AFB, Big Spring
William Beaumont Gen Hosp, El Paso

UTAH

Hill AFB, Ogden

VIRGINIA

Langley AFB, Hampton
Fort Belvior, Fairfax County
Fort Eustis, Lee Hall
Fort Lee, Petersburg
Fort Monroe, Old Point Comfort
NAS, Norfolk
Naval Hosp, Portsmouth
Naval Hosp, Quantico
MCAS, Quantico
NAS, Virginia Beach

WASHINGTON

Fairchild AFB, Spokane
Fort Lewis, Tacoma
McChord AFB, Tacoma
Naval Hosp, Bremerton
NAS, Seattle
NAS, Whidbey Island

WYOMING

Francis E. Warren AFB, Cheyenne

CANAL ZONE

Albrook AFB, Balboa
Fort Clayton

CUBA

USN Hosp, Guantanamo Bay

ENGLAND

S. Ruislip Air Stn, Middlesex
USN Support Activity, London

GERMANY

US Army Hsp, Heidelberg
Wiesbaden AB, Wiesbaden

GUAM

USN Hosp

ITALY

USN Support Activity, Naples

JAPAN

Camp Zama
Tachikawa AB, Honshu
USN Hosp, Yukosuka

NEWFOUNDLAND

USN Stn, Argentia

PHILIPPINE ISLANDS

Clark AB, Luzon
USN Hosp, Subic Bay

PUERTO RICO

Ramey AFB, Aguadilla
USNAS, Roosevelt Rds

SPAIN

Torrejon AB
USNAS, Rota

Progress Reports on Qualifications

In order to keep candidates informed concerning their qualification for admission, the Naval Academy will issue progress reports on academic, medical, and physical aptitude qualifications when such information is complete.

Early Notification of Admission

Candidates who hold principal nominations to the Naval Academy will be notified of acceptance as soon as they meet all entrance requirements. Additionally, the most outstanding among other qualified candidates may be notified early after completed evaluation and approval by the Academic Board. Candidates must complete the required College Entrance Examination Board tests not later than January in order to be considered for early notification.

Entrance Information and Procedures

Candidates for whom there are vacancies, who have subscribed to the "Engagement to Serve," and who have met the scholastic, moral, and physical requirements, will receive appointments as midshipmen and be admitted to the Naval Academy.

☐ *Each candidate for midshipman will be required to take the following oath of office upon entrance:*

> "I, ..., having been appointed a midshipman in the United States Navy, do solemnly swear (or affirm) that I will support and defend the Constitution of the United States against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; that I take this obligation freely, without any mental reservation or purpose of evasion; and that I will well and faithfully discharge the duties of the office on which I am about to enter; So Help Me God."

☐ *He will also be required to subscribe to the following under oath:*

> "For and in consideration of the privileges, opportunities, and benefits afforded me during the continuance of my service as a midshipman, I agree to and with the Superintendent of the United States Naval Academy, as follows:
>
> "First: To enter the service of the Navy of the United States and, to the utmost of my power and ability, to be in everything conformable and obedient to the several requirements and lawful commands of the officers who may be placed over me.
>
> "Second: I oblige myself, during such service, to comply with and be subject to the Uniform Code of Military Justice and such other laws and regulations as are or shall be established by the Congress of the United States or other competent authority.
>
> "Third: To submit to treatment for the prevention of smallpox, typhoid (typhoid prophylaxis), and to such other preventive measures as may be considered necessary by naval authorities."

Candidates are usually sworn in as midshipmen on the day they are accepted for admission, i.e., the date of reporting to the Naval Academy as designated in the authorization to report issued by the Bureau of Naval Personnel. Due to limited living accommodations in the city of Annapolis, candidates are urged to time their arrival at Annapolis to coincide as closely as possible with the reporting date, keeping in mind, however, that transportation facilities between Washington and Baltimore and Annapolis are not unlimited. Those arriving in Annapolis a day or two prior to their reporting date may take advantage of berthing and messing facilities usually made available in the Naval Academy at a cost of $1 per night. Additionally, candidates may take their meals in the Midshipmen's Mess at a cost equal to the cost of a midshipman's daily ration allowance.

☐ *In keeping with the policy of the Department of Defense and as directed by the Secretary of the Navy, candidates for appointment as midshipmen are required to execute a loyalty certificate.* The purpose of this certificate is to aid in determining whether the candidate's conduct or associations, past or present, have been such as to cast any doubt whatever upon his loyalty to the Government of the United States.

The loyalty certificate includes a list of those agencies, groups, etc., designated by the Attorney General of the United States to be totalitarian, fascist, communist or subversive, or as having adopted a policy of advocating or approving the commission of acts of force or violence to deny persons their rights under the Constitution of the United States.

The admission of conduct or association, past or present, within the purview of acts as defined in the certificate, or association with any of the groups or organizations designated by the Attorney General, shall preclude appointment pending investigation and determination of eligibility by the Department of the Navy.

False representation, or failure fully to disclose conduct or associations defined in the certificate, shall constitute grounds for trial before a general court-martial with possible subsequent conviction and imprisonment, or for separation from the naval service under conditions other than honorable, with or without any preceding court-martial procedure.

☐ *Before being admitted as a midshipman, each candidate must deposit with the midshipmen's storekeeper the sum of $300, to be used in part payment to cover cost of uniforms, clothing,* etc. In cases of extreme hardship this sum may be reduced to $100, in which case money allowances for the individual will be reduced until the individual's account reaches prescribed levels. The amount deposited is not refunded, but is expended for entrance outfit, clothing, uniforms, etc., which become the property of the midshipman.

☐ *The pay of the midshipman is $2,059.20 a year, commencing at the date of his admission.* Its purpose is to permit him to cover his expenses; i.e., uniforms, books, equipment, laundry, income tax, spending money, etc., while at the Naval Academy.

☐ *The regulation entrance outfit, plus the additional uniforms, clothing, textbooks, and expenses required the first year, are valued at approximately $1,600.* The deposit made at the time of entrance is supplemented by an entrance credit of $600 upon first admission to the Naval Academy. The $600 credit is an interest-free loan advanced by the Government to defray the cost of the uniforms and equipment required during the first year. Repayment of the indebtedness is accomplished by monthly deductions of $20 from the midshipman's pay, beginning in October of the second year at the Naval Academy and continuing until the indebtedness is liquidated. Midshipmen who are involuntarily separated from the Naval Academy prior to repayment of the entrance credit, are required to turn in all articles of uniform and equipment deemed suitable for reissue, to an amount sufficient to liquidate the indebtedness. If reclaimed articles are insufficient to cover the indebtedness, parents will be given an opportunity to liquidate the remaining debt; failing this, the remainder of the debt is canceled. Midshipmen applying for voluntary separation for their own convenience are required to repay in full the amount of indebtedness prior to such separation.

☐ *Every candidate must present his Social Security Card upon reporting for appointment.* If an individual has not obtained a Social Security number as a result of work experience prior to entering, he should obtain one based on the length of expected employment as a midshipman.

☐ *Shortly after entrance, each midshipman* (except Foreign Nationals) *will be required to complete a Statement of Personal History.* Candidates should be prepared to furnish such information as:

Names and locations of all schools attended.

Family names, dates and places of birth of parents, service data if parents are or were in armed forces, naturalization numbers of parents if applicable.

Relatives in foreign countries—relationship and location.

Names and addresses of former employers.

Names and addresses of three credit and five personal references (Credit references may be those of parents.)

Residences during past 15 years. (Dates, street addresses, and cities are required.)

☐ *Candidates admitted as midshipmen will be required to submit documentary evidence of birth to the Superintendent, U.S. Naval Academy, for transmission to the Bureau of Naval Personnel upon admission, or as soon as practicable thereafter.* A certified copy of the public record of birth is the best evidence. Supporting evidence will be required if the name on the evidence of birth is not identical with the name being used.

☐ *Upon entrance, midshipmen will be required to obtain from the midshipmen's storekeeper a regulation entrance outfit.* Slide rules and drawing sets are furnished as part of the outfit. Candidates are advised, therefore, not to purchase these items prior to entering the Academy.

☐ *After being admitted to the Naval Academy, midshipmen receive travel and transportation allowances as prescribed in* Joint Travel Regulations *(ordinarily, mileage allowance of 6 cents per mile for authorized travel).* The reimbursement will be paid to the midshipmen. Reimbursement will be made for the actual cost of passage fares on commercial vessels if sea travel is involved and provided no Government transportation was available. In the event travel originates outside the United States, candidates must contact the nearest naval activity for information as to the availability of Government transportation before endeavoring to procure commercial transportation. When Government transportation is not available, a certified statement to this effect must be presented in order for the candidate to be reimbursed after he has become a midshipman.

☐ *The four-year course of instruction at the Naval Academy is designed for the purpose of educating and training students to become officers in the Navy.* The word "officers" as used in the foregoing sentence means officers of the line and does not include officers of the Medical Corps, Dental Corps, etc. The curriculum provides a basic education in naval science, science and engineering, and the humanities and social sciences. In addition, there is opportunity for advanced work through validation of college-level courses successfully completed elsewhere, and through a program of elective courses. No midshipman can be admitted or readmitted to other than the Fourth Class (freshman). Readmitted midshipmen who previously completed successfully one or more years of the Naval Academy course may request advancement to a higher class after reentry. There can be no deviation from the statutory age limits.

☐ *Graduates of the Naval Academy who meet all requirements are commissioned as ensigns in the Navy or (a limited number) as second lieutenants in the Marine Corps.* While in previous years a few Naval Academy graduates have been commissioned in the Army and the Air Force, it is now the policy of the Secretary of the Navy that, subsequent to the commissioning of the Class of 1967, no midshipman will be allowed to transfer to another service upon graduation. Their commissions may be revoked at any time during the first three years following graduation from the Naval Academy. On successful completion of the probationary period, officers are permanently commissioned. Officers whose commissions are revoked shall be discharged from the service, without severance pay or allowance.

Service Obligation of Midshipmen

Enlisted members of the Armed Forces who accept appointments as midshipmen at the Naval Academy will not be discharged from their enlistment contracts or from their period of obligated service while they are in the status of midshipmen, except for physical disability or because of the acceptance of a commission. (Act of 25 June 1956, §§ 1–2, reenacted 10 U.S.C. 516.)

Midshipmen in this category who are separated from the Naval Academy, except for one of the two reasons given above, will have their appointments as midshipmen terminated and will immediately resume their enlisted status. Members so reverted will be required to serve out their enlistments or obligated service, unless sooner discharged. In computing the unexpired portion of an enlistment contract or period of obligated service, the time served as a midshipman shall be counted as time served under such contract or period of obligated service.

Candidates entering the Naval Academy from civil life, who had not previously acquired a military obligation, will automatically do so upon acceptance of appointment as midshipmen at the United States Naval Academy. Under Section 651 of Title 10, United States Code, any person who is enlisted, inducted, or appointed in any of the Armed Services or their reserve components acquires automatically a six-year military obligation. Section IV. B. 3.f of Department of Defense Directive 1200.3 of 23 May 1958 includes appointees to the service academies among those who are subject to the six-year obligation.

Agreement Signed by Entering Midshipmen

Upon admission, each midshipman who is a citizen of the U.S. will be required to sign an agreement, with the consent of his parents or guardian if a minor, that he will fulfill these obligations:

☐ He will complete the Academy course of instruction (unless he is disenrolled from the Academy by competent authority).

☐ He will accept an appointment and serve as a commissioned officer in the United States Navy or United States Marine Corps for at least five years immediately after graduation.

☐ If authorized to resign from the Regular component before the sixth anniversary of his graduation, he will serve as a commissioned officer in the Reserve component until the sixth anniversary.

Policies Regarding Disenrollment

He also signs a statement that he understands that the following are the policies of the Navy Department regarding disenrollment from the Naval Academy:

☐ Fourth and Third Classmen will be discharged in accordance with the regulations of the Navy Department. A resignation tendered by a Fourth or Third Classmen (or a resignation tendered by a Second Classman prior to the beginning of the Second Class academic year) will be accepted when found to be in the best interests of the service.

☐ Second and First Classmen. A Second Classman who is separated prior to the commencement of the Second Class academic year will be discharged in accordance with current regulations of the Navy Department. With the commencement of the Second Class academic year, a Second or First Classman who is separated prior to completing the course of instruction, except for physical disability, unfitness or unsuitability, will normally be transferred to the Reserve component in an enlisted status and be ordered to active duty for not less than two years under the provisions of Title 10, U. S. C. 6959b. Where separation occurs as a result of deficiencies, which are not considered willful, the active duty provision may be waived.

☐ Refusal to Accept Commission. Any First Classman who completes the course of instruction and declines to accept an appointment as a commissioned officer will be transferred to the Reserve component in an appropriate enlisted status and ordered to active duty for four years.

☐ A midshipman who is separated and who entered from the Regular or Reserve component of any service will revert to his former status under the appropriate statutory provisions. Completion or partial completion of a prior service obligation by a separated midshipman who entered from this status does not necessarily exempt him from transfer to a Reserve component and call to active duty in accordance with Title 10, USC 6959b.

☐ Officers of the Armed Services serve at the pleasure of the President. No terminal dates are established for their commissions.

Foreign Students

Persons receiving instruction under authority of this law shall receive the same pay, allowances, and emoluments, to be paid from the same appropriations and, subject to such exceptions as may be determined by the Secretary of the Navy, shall be subject to the same rules and regulations governing admission, attendance, discipline, resignation, discharge, dismissal, and graduation, as midshipmen at the Naval Academy appointed from the United States; but such persons shall not be entitled to appointment to any office or position in the United States Navy by reason of their graduation from the Naval Academy. The entrance deposit will be required of all foreign students. Applications for appointment under provisions of this law must be addressed through diplomatic channels of the applicant's country. Nominations must reach the State Department in Washington, D.C., by 1 January 1970.

Each candidate must:

☐ Be an unmarried, bona fide male citizen of the nominating country and, unless otherwise approved by the Secretary of the Navy, be not less than 17 years of age and not yet 22 years of age on 1 July of the calendar year in which he enters the Naval Academy.

☐ Possess medical qualifications as specified in this pamphlet. All candidates must undergo a medical examination and a physical aptitude examination by a board of medical examiners designated by the Chief of Naval Personnel. Qualifying Medical and Physical Aptitude examinations will be conducted by the Permanent Medical Examining Board at the United States Naval Academy at the time of reporting for admission. Such candidates are therefore urged to undergo careful preliminary examination by qualified medical personnel informed of the physical requirements set forth elsewhere in this pamphlet before leaving their homes for the Naval Academy. Those with obviously disqualifying defects may be spared the needless expense of the trip to Annapolis. However, in case of reasonable doubt as to whether defects are disqualifying, it is recommended that the telegraphic inquiry be addressed to the Superintendent, U.S. Naval Academy, Annapolis, Md., U.S.A.

☐ Be proficient in reading, writing, and speaking idiomatic English. Candidates may meet scholastic entrance requirements by either of the following two methods:

☐ Submitting certificates from accredited secondary schools and colleges of the United States of America, or

☐ Taking the College Entrance Examination Board Scholastic Aptitude Test and the Achievement Tests in English Composition and Mathematics, Level I or Level II.

Candidates will be given the same examination in English composition as other candidates, but due consideration will be accorded these foreign students when evaluating test results. Each candidate shall submit a certificate from his government that he is conversant with the literature of his native country and that he has completed a course in the literature of his native language equivalent in general to two years of secondary school work in literature in the United States. In lieu of this certification, a candidate may produce evidence of having acquired the units of literature from accredited schools of the United States.

The Naval attaché or a diplomatic representative of the United States in the candidate's country shall furnish a report as to the candidate's proficiency in the use of idiomatic English.

Governments should submit the names of candidates as early as possible in order that they may qualify for entrance by the end of March and enter the Naval Academy in late June or early July, except in the cases of candidates attending secondary schools and colleges in the United States whose school records for the current year are essential to fulfillment of admission requirements. In such cases candidates may be granted until 25 June in order to permit completion of the required certificates. The nomination of the candidates should contain a statement of the method of admission under which he wishes to qualify.

In lieu of the oath of allegiance to the United States, a substitute oath will be required, in substance as follows:

> "I ...., a citizen of ...., having been appointed a midshipman at the United States Naval Academy, do solemnly swear to comply with all regulations for the police and discipline of the Naval Academy, and to give my utmost efforts to accomplish satisfactorily the required curriculum; do swear not to divulge any information of military value which I may obtain directly or indirectly in consequence of my presence at the United States Naval Academy to any alien government; and do agree that I shall be withdrawn from the United States Naval Academy if deficient in conduct, health, or studies."

Notification will be given to the governments that students found by proper authority to be unsatisfactory in conduct, studies, or health will be accorded the same consideration given other midshipmen regarding withdrawal from the Academy or repetition of a year's work.

Preparatory Scholarships

The U.S. Naval Academy Foundation, Inc., is a tax-exempt, nonprofit organization which provides an educational assistance program to enable deserving young men, with minor academic deficiencies, to enhance their qualifications for admission to the Naval Academy. The Foundation is chartered for educational purposes under the laws of the State of Maryland. It has no official connection with the U.S. Navy or with the U.S. Naval Academy.

The Foundation provides a limited number of post-high-school preparatory scholarships annually to highly motivated and qualified young men seeking admission to the Naval Academy to prepare for a career in the Navy or Marine Corps. Cash grants for these scholarships are made to specific junior colleges and preparatory schools in various parts of the nation. Parents of young men selected for this program are expected to contribute financially within their capabilities. The Foundation offers no assistance to individual boys in obtaining appointments.

Application should be made to the Executive Director, U.S. Naval Academy Foundation, Inc., 48 Maryland Avenue, Annapolis, Md. 21401. Applications must be received by 1 April each year.

Several other preparatory-school scholarships are available to young men seeking admission to the Naval Academy. Information concerning these scholarships may be obtained from the Chief of Naval Personnel (PERS-G211), Navy Department, Wash., D.C. 20370.

Naval Academy Preparatory School

The Naval Academy Preparatory School, located at Bainbridge, Maryland, has prepared servicemen for entry into the Naval Academy for over half a century. Up to 350 enlisted men, almost all regular or reserve Navy and Marine Corps personnel, are enrolled at the school from September to May each year. The current class is about half regular and half reserve.

Applicants meeting basic qualifications for entry into the Naval Academy should apply through their commanding officers in accordance with current service directives. Students are selected competitively based on a review of their records, including academic transcripts, the recommendations of their commanding officers, and their scores on the Naval Academy Preparatory Entrance Examination.

The Preparatory School offers college-preparatory work in mathematics, physics, chemistry, and English. Students with superior backgrounds and abilities are able to undertake more-advanced work, including courses at the college freshman level. Military, physical training, and intramural and varsity sports programs complete the school's schedule.

Important Dates for Candidates

1969

July	The Navy Department begins officially accepting the names of candidates nominated for appointment in 1970. Medical Examining Centers commence conducting Medical and Physical Aptitude Examinations. The U.S. Civil Service Commission holds the first of several competitive tests for Members of Congress who utilize this means of selecting their candidates.
November 1	Administration of College Entrance Examination Board Scholastic Aptitude Tests (SAT).
December 6	Administration of College Entrance Examination Board Tests (SAT and Achievement).

1970

January 10	Administration of College Entrance Examination Board Tests. (SAT and Achievement). Candidates must complete required CEEB Tests by this date in order to be considered for early notification.
January 15	Early notification begins.
January 31	Closing date for the nomination of candidates.
March 8	Administration of College Entrance Examination Board Tests (SAT and Achievement).
March 15	Final decision reached on medical and physical qualifications by this date.
April 15	Bureau of Naval Personnel notifies candidates of the status of their candidacy and begins to issue authorizations to report for appointment as midshipmen to successful candidates.
June 24	Date on which successful candidates are authorized to report to the Naval Academy for appointment as midshipmen.

The Naval Officer's Career

A Way of Life

Inscribed in Latin above the bronze doors of the Naval Academy Chapel is the motto *Not Self, But Country*—a motto which the young candidate embraces the moment he takes the oath as a midshipman and which will be a part of his being for the rest of his life. His education at the Academy has been designed for one purpose only: to prepare him for a lifetime career as a dedicated professional in the Naval Service. After four years of intensive study at Annapolis, he is ready to assume his responsibilities as an officer in the greatest Navy in the world.

This is a complex Navy—one whose ships range every ocean, whose officers and men not only sail the seas but are also engaged in construction and research from the tropics to the poles, whose supersonic planes have provided the training ground for America's first astronauts, whose nuclear submarines are a testimony to America's engineering genius, whose leaders advise in the highest councils of government, and whose Marines stand second to none where tales of valor are told. Though a vastly complicated and technological Navy, the human being is, in the end, all-important. It is an organization which puts a high premium on leaders with vision, dedication, and ability. It is a Navy with a proud past and a promising future, broad enough to provide a stimulating challenge in a wide spectrum of interesting fields.

First Duty

A graduate's first career opportunity comes in his choice of branch of service. The priority assigned his individual preference is dependent upon a number of factors, including his class standing, the needs of the Navy, and his personal qualifications. Every attempt is made to assign him to the duty and locality of his first choice.

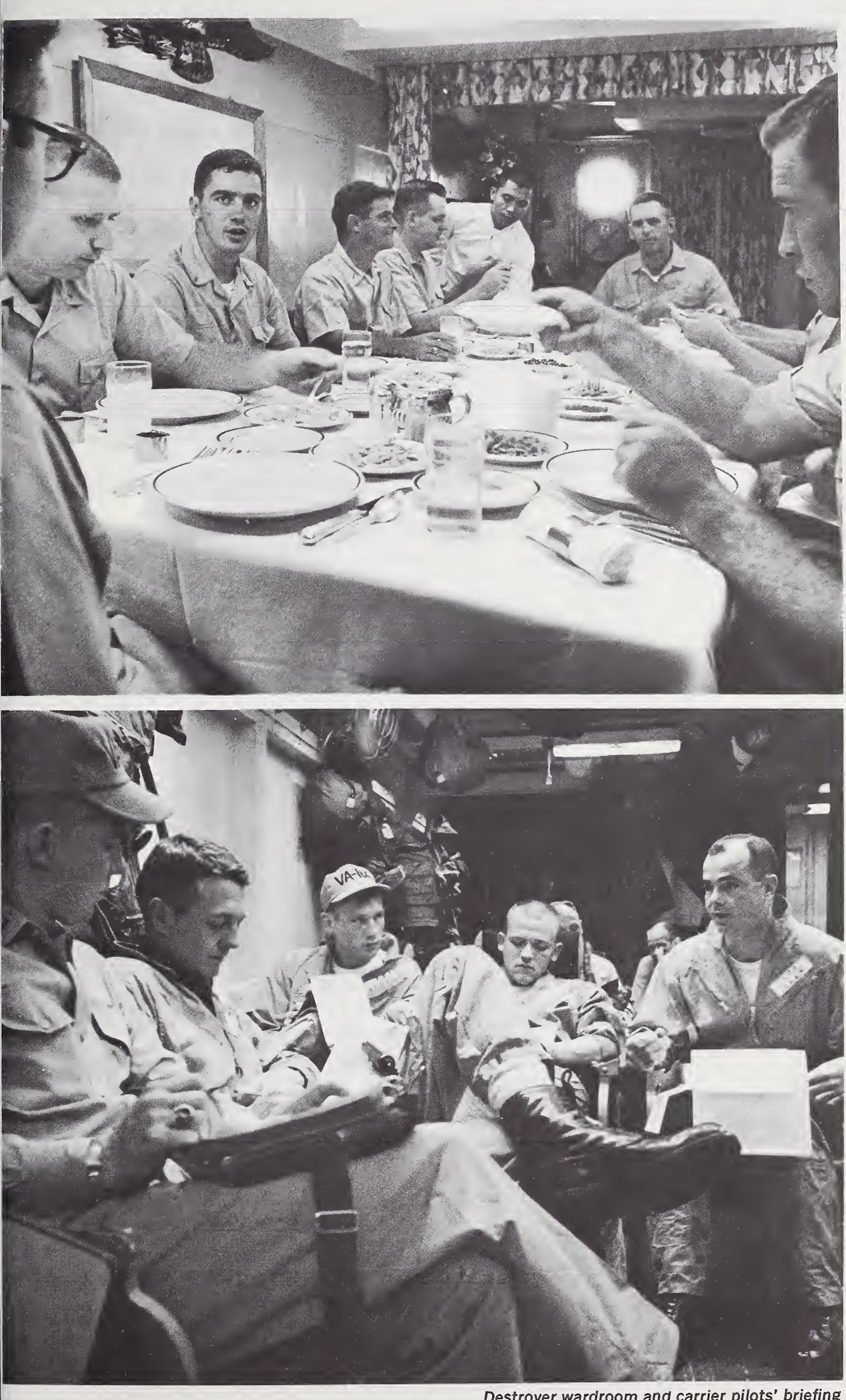
Whatever his initial operational duty, he will usually find that his responsibilities are larger than those of his contemporaries in civilian life. Most Naval Academy graduates are commissioned as ensigns in the line and are, thus, ultimately headed for command at sea. While many go initially to sea in a combatant-type ship—i.e., aircraft carrier, cruiser, destroyer, or amphibious ship—others go immediately into aviation, submarine, or nuclear power training, and some go to studies leading to advanced degrees.

A small number are commissioned on graduation in the Civil Engineer Corps, in the Supply Corps, or as Engineering Duty Officers. The civil engineer designees, after a short tour in a Public Works or Seabee outfit, proceed to graduate studies at a civilian university. Supply Corps officers attend a special Navy school of several months' duration prior to their first operating assignment. The Engineering Duty Officers (specialists in ship design, construction, and repair) will normally spend several months aboard ship before returning to graduate study. Those commissioned as second lieutenants in the Marine Corps are ordered to a course in basic training before joining regular Marine units.

Officer Career Patterns

Within the framework of the needs of the service, an officer determines his own career pattern to a significant degree through his requests for assignments afloat and ashore, his advanced studies, and, of course, by his performance. Following initial tours at sea in surface combatants, some graduates request assignment to aviation, submarine, or nuclear power training. A small number may apply to serve in more specialized fields, and are designated, as were some of their classmates at graduation, as Civil Engineer Corps, Supply Corps, or Engineering Duty Officers. The careers of many of these specialists tend to concentrate in the industrial management field and, to some extent, in research and development, and much of their work is with the civilian world.

A line officer finds that tours of operational duty with Fleet components are alternated with assignments to bureaus, offices, and activities in the Navy's vast shore establishment. Experience at sea is of prime importance to this officer, for it is at sea that he increases his competence as a mariner and as a leader. The early years of experience at sea form a basis for his career, which will include



Destroyer wardroom and carrier pilots' briefing

the opportunity to apply his seagoing experience in the management of supporting shore facilities. Assignments are varied and interesting, and include not only military command but the opportunity to work with the civilian employees of the armed forces as well as with members of the other services. In all assignments, individual preference is given careful consideration.

Officer careers continue along many paths, depending upon individual experience and background. After his graduate tour, a line officer may return to sea as a head of department in a destroyer or as commanding officer of a smaller combatant vessel. Aviators may expect assignment to an aircraft squadron based in a carrier or ashore. Officers qualified in submarines will continue in duties preparing them for submarine command, which comes after about 12 years of commissioned service.

Every officer may expect to serve in assignments in which his education and naval training will be most valuable. Many unrestricted line officers, whose specialty is naval warfare and command at sea, qualify for a subspecialty which they exercise during periods of shore duty. These subspecialties include such varied fields as naval intelligence, oceanography, communications, meteorology, nuclear engineering, and aeronautical engineering. In addition, officers aspiring to command at sea will serve in a variety of ships or aircraft in different capacities, as well as in staff and planning billets afloat and ashore, in the United States and overseas.

It is a satisfying but demanding life. The naval officer presents many faces to the world: Fleet Commander, engineer, scientist, diplomat, and educator. His is not just a job, but a way of life—a career dedicated to the service of the United States carrying with it high professional prestige and opportunities for broad experience—a career which rewards the industrious, the sincere, the adventurous, and the imaginative. The Navy is not a career field for those who prefer a soft life and who shy away from challenges. It is, rather, one for those to whom the homely virtues of a strenuous life, patriotism, and dedication to an ideal have a real meaning which can be translated into a lifetime of service in the Navy of the United States.

Officer Education and Training

Upon graduation and commissioning, the new officer may lay his books aside momentarily, but his theoretical and practical education will continue as long as he is in the service. From graduation day forward, he will continue to prepare himself for assignments of greater responsibility and professional attainment by acquiring practical experience ashore and afloat and through advanced academic work. The extent of his attainment is limited only by his ability, initiative, energy, and resourcefulness, commensurate with logical career planning.

The Navy's senior admiral, Admiral Thomas H. Moorer

The Naval Academy is considered but the first step in the educational ladder for the typical officer, and so the Navy sponsors a wide variety of graduate programs, at both naval and civilian institutions, designed to prepare the officer for higher responsibility. This move toward graduate education is begun in some cases before graduation, when some midshipmen are selected for scholarships in civilian universities or for Navy-sponsored graduate programs. Most notable of the scholarships, and one in which Academy graduates have been most successful to date, has been the Rhodes scholarship, tenable at Oxford University.

Navy functional and basic technical courses provide the initial post-commissioning training for many officers. Mostly of short duration, they are in such fields as communications, gunnery, antisubmarine warfare, damage control, electronics, and amphibious warfare.

After the first tour (3 to 6 years) of operational duty with the Fleet, many qualified Naval Academy graduates may expect orders to graduate study for one or more years. Many fields of study are open to them, including, but not necessarily restricted to, those of mathematics, physics, general science, nuclear and aeronautical engineering, management, international relations, and naval intelligence. For the best-qualified, the way is open to a doctorate. Courses are conducted at the U.S. Naval Postgraduate School, Monterey, Calif.; the Naval Intelligence School, Washington, D.C.; the Test Pilot School, Patuxent River, Md.; and at various civilian institutions such as Carnegie Institute of Technology, Harvard, MIT, Princeton, Rensselaer, Stanford, and Tulane.

It should be noted that opportunities for graduate work afforded in the early years of commissioned service continue throughout an officer's career. Senior war colleges, in particular, are noted for bringing officers up to date on problems of international import and for relating these problems to our global strategy. The officer who aspires to positions of high responsibility will, of necessity, have to continue to grow intellectually and thus be part-student all of his professional life.

Following is a brief summary of graduate study opportunities offered by the Navy. The program summarized is typical of recent years. Additional opportunities for graduate study are available to highly qualified graduates through other Navy-sponsored programs and through Fulbright, Olmstead, Churchill, and Rhodes Scholarship programs and through Atomic Energy Commission, National Science Foundation, Guggenheim, and other Fellowships. Over 100 members of the Class of 1968 were preselected for various graduate study programs.

Technical Curricula

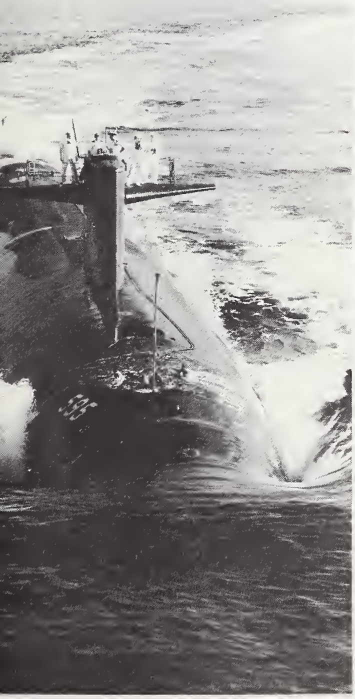
Curriculum	Location	Degree Attainable
Advanced Science	U.S. Naval Postgraduate School (USNPGS), Monterey (1 year), followed by study at selected civilian institutions.	M.S./Ph. D.
Aeronautical Engineering	USNPGS, Monterey	B.S./M.S./ Ae. E.
Civil Engineering (Advanced)	Illinois, Michigan, M.I.T., Stanford, Princeton, etc.	M.S.
Communications Engineering	USNPGS, Monterey	B.S./M.S.
Management/Data Processing	USNPGS, Monterey	M.S.
Electrical Engineering	University of Michigan	M.S.
Engineering Electronics	USNPGS, Monterey	B.S./M.S.
Engineering Electronics	University of Michigan	M.S.
Engineering Science	USNPGS, Monterey	B.S.
Environmental Sciences (Meteorology and Oceanography options).	USNPGS, Monterey	B.S./M.S.

Curriculum	Location	Degree Attainable
Hydrographic Engineering (Geodesy).	Ohio State University	M.S.
Management and Industrial Engineering.	R.P.I	M.S.
Mechanical Engineering	R.P.I	M.S.
Metallurgical Engineering	Carnegie Tech	None.
Naval Construction and Engineering.	M.I.T. and Webb Institute of Naval Architecture.	M.S./Nav. E
Naval Mechanical and Electrical Engineering.	USNPGS, Monterey	B.S./M.S.
Nuclear Engineering (Advanced).	M.I.T. (many include 6-month course at Westinghouse Electric).	M.S.
Nuclear Engineering (Effects)	USNPGS, Monterey	B.S./M.S.
Nuclear Power Engineering	Universities of California (Berkeley) and Michigan.	M.S.
Oceanography	USNPGS, Monterey, University of Miami (Florida), Texas A&M, and University of Washington.	B.S./M.S.
Operations Analysis	USNPGS, Monterey	B.S./A.S.
Petroleum Engineering	University of Texas	M.S.
Textile Technology	North Carolina State	M. Tex. Tech.
Weapons Systems	USNPGS, Monterey	B.S./M.S.
	Michigan State University	M.S.
Ph. D. Studies	(Location and length of study determined subsequent to selection of candidates).	Ph. D.

Nontechnical Curricula

Business Administration	Harvard and Stanford Universities.	M.B.A.
Defense Intelligence	Defense Intelligence School	None.
Financial Management	George Washington University	M.B.A.
International Relations	American and Harvard Universities.	M.A.
Logistics (AFIT Course)	AFIT, Wright-Patterson AFB, Ohio.	M.S.
Naval Management	USNPGS, Monterey	M.S.

Curriculum	Location	Degree Attainable
Petroleum Administration and Management.	Southern Methodist University.	M.S.
Petroleum Management	University of Kansas	M.S.
Political Science	Fletcher School of Law and Diplomacy, Tufts University.	M.A.
Procurement Management	University of Michigan	M.B.A.
Public Relations	Boston University	M.S.
Retailing	Pittsburgh University	M.B.A.
Subsistence Technology	Michigan State University	M.B.A.
Systems Inventory Management.	Harvard University	M.B.A.
Transportation Management	Michigan State University	M.B.A.
Ph. D. Studies	(Location and length of study determined subsequent to selection of candidates.)	Ph. D.



The Academic Program

The four-year academic program of the Naval Academy is undergraduate in scope and leads to the Bachelor of Science degree. The awarding of the degree to graduates of the Naval Academy is authorized by act of Congress. The Academy is accredited by the Middle States Association of Colleges and Secondary Schools.

The Basic Curriculum

The curriculum at the U.S. Naval Academy has been developed to provide each midshipman with the skills and knowledge necessary for the performance of his duties as a junior officer in the U.S. Navy or the U.S. Marine Corps. This is the primary goal of the Academy.

A core curriculum provides him with a broad liberal education in mathematics, science, social science and the humanities, and a thorough background in seamanship, navigation, engineering, and weaponry. A selection of 23 minors and 23 majors allows him to concentrate his studies in a field of his choice.

Every midshipman is required to complete the courses in the core curriculum (or to validate equivalent college-level work) and to complete one of the minors offered. Through validation and/or the carrying of additional courses, midshipmen are able to take advanced undergraduate work for the fuller development of individual talents. Many earn majors. Normally 12–16 semester hours beyond the minor make up the major. Courses and academic programs, by departments, are described on pages 102–189. Over 300 electives are offered.

The Basic Curriculum

The Academic Program

FOURTH CLASS YEAR [1]

First Semester		Hours Class/Lab
H101	Composition and Literature	3/0
L101	Modern Languages	3/0
M111	Calculus I	4/0
N101	Fundamentals of Naval Science	3/2
S101	General Chemistry I	3/2
T101	Physical Education	
X101	Infantry Drill	
		16/4
Total Sem Hrs		**18**

Second Semester		
H102	Composition and Literature	3/0
L102	Modern Languages	3/0
M120	Calculus II	4/0
S102	General Chemistry II	3/2
W102	Fundamentals of Weapons and Engineering	3/0
T102	Physical Education	
X102	Infantry Drill	
		16/2
Total Sem Hrs		**17**

THIRD CLASS YEAR [2]

First Semester		Hours Class/Lab
E209	Engineering Statics and Dynamics	4/0
H201	European Civilization and World Power since the French Revolution	3/0
M215	Calculus III	4/0
S211	General Physics I	3/2
.....	Elective (minor)	3/2 or 3/0
T201	Physical Education	
X201	Infantry Drill	
		17/2–4
Total Sem Hrs		**18/19**

Second Semester		
E210	Mechanics of Materials	3/2
M224	Analysis IV	4/0
N208	Navigation I	3/2
S212	General Physics II	3/2
.....	Elective (minor)	3/2 or 3/0
T202	Physical Education	
X202	Infantry Drill	
		16/6–8
Total Sem Hrs		**19/20**

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[1] Fourth Class Summer includes placement and validation tests; an introduction to mechanical, aeronautical, and naval engineering (Engineering Department); library briefings and lectures on history and traditions (English, History, and Government Department); rifle and pistol instruction (W100, Weapons Department); professional drills and lectures (P100, Naval Science Department); physical education orientation and indoctrination (T100, Physical Education Department); orientation and indoctrination (X100 Executive Department); hygiene lectures (Y100, Medical Department.)

[2] Midshipmen train at sea for eight weeks with the Fleet during Third Class Summer (P201).

SECOND CLASS YEAR [1]

First Semester		Hours Class/Lab
H303	U.S. Government and Constitutional Development	3/0
M309	Analysis V	3/0
N313	Navigation II	2/2
S305	Introduction to Electrical Science	3/2
.....	Elective (minor)	3/2 or 3/0
T301	Physical Education	
X301	Infantry Drill and Naval Orientation	
		14/4–6
Total Sem Hrs		**16/17**

Second Semester		
H304	Economic Analysis	3/0
N318	Naval Operations Analysis	3/2
S206	Modern Physics	3/0
S306	Applications of Electrical Science	3/2
.....	Elective (minor)	3/2 or 3/0
T302	Physical Education	
X302	Infantry Drill and Naval Orientation	
		15/4–6
Total Sem Hrs		**17/18**

FIRST CLASS YEAR [2]

First Semester		Hours Class/Lab
E313	Elements of Thermodynamics	3/2
H403	History of Sea Power	3/0
N409	Leadership and Military Law	3/0
N415	Operations and Tactics II	0/2
W411	Weapons Systems Control	3/2
.....	Elective (minor)	3/2 or 3/0
T401	Physical Education	
X401	Infantry Drill and Naval Orientation	
		15/6–8
Total Sem Hrs		**18/19**

Second Semester		
E314	Elements of Fluid Mechanics	3/2
H404	Readings in Western Ideas	3/0
H406	The United States in World Affairs	3/0
W413	Ballistics and Weapons Control	3/2
.....	Elective (minor)	3/2 or 3/0
T402	Physical Education	
X402	Infantry Drill and Naval Orientation	
		15/6–8
Total Sem Hrs		**18/19**

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[1] Second Class Summer includes aviation, submarine, and amphibious training, all conducted away from the Academy with Fleet operational and training units. At the Academy, summer studies include H300 Speech—One Sem Hr (1–0) and N311 Operations and Tactics I—Three Sem Hrs (2–2).

[2] Midshipmen train at sea for eight weeks with the Fleet during First Class Summer (P400).

The Academic Organization

Responsibility for direction of the Naval Academy is vested in the Superintendent. This position is held by a flag officer of the Navy. The Superintendent is assisted by the Commandant of Midshipmen, who is responsible for directing the military and physical training and the administration of the Brigade of Midshipmen, and by a civilian Academic Dean, who supervises the academic curriculum and standards.

The Superintendent, the Commandant, the Dean, and other senior members of the faculty comprise the Academic Board, which makes major academic decisions and sets the academic standards of the Academy. There are seven academic departments: Engineering; English, History, and Government; Modern Languages; Mathematics; Naval Science; and Weapons, each headed by a Navy captain who reports directly to the Academic Dean.

The Faculty

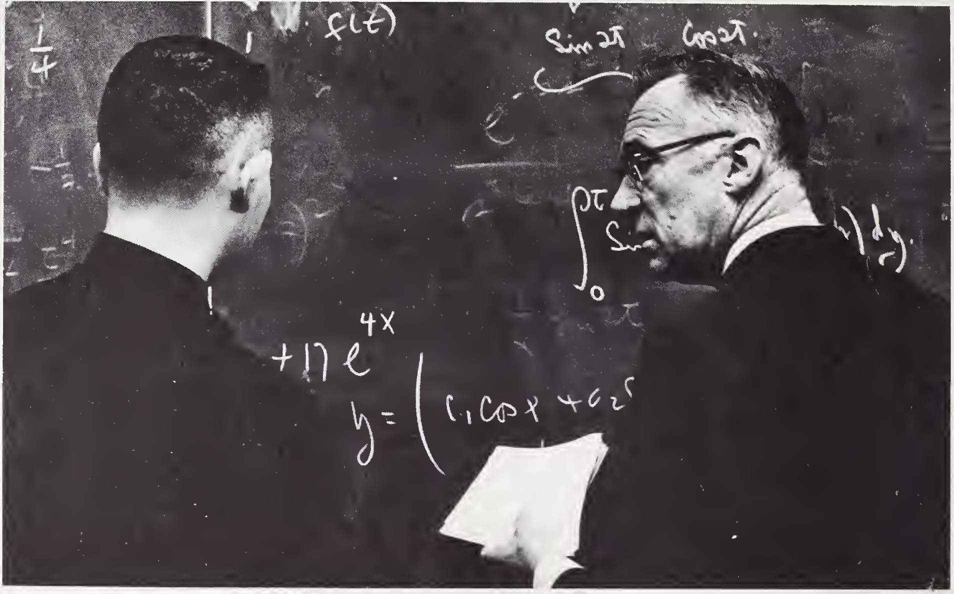
When Commander Buchanan, first Superintendent of the Naval Academy, included three civilian teachers among his seven-man faculty, he founded a policy which has borne the test of more than a century. Today the Naval Academy faculty, which has grown to more than 600, is still an integrated group of officers and civilians in approximately equal numbers. The officers, rotated at intervals of about three years, provide a continuing input of new ideas and experience from the Fleet. The civilians provide a core of professional scholarship and teaching experience as well as continuity to the Academy's educational program.

Well over 100 different colleges and universities in the Americas, Western Europe, and the Far East are represented in the backgrounds of the Academy's faculty. Most officer faculty members are naval (or marine) officers, but all the armed forces and the State Department are represented. Foreign officers also serve with the faculty through exchange programs, instructing in their native languages and providing midshipmen an early insight into the international aspects of naval life.

Military and civilian members of the faculty are assigned to academic departments in accordance with their individual backgrounds and talents. For example, the Naval Science and Weapons Departments are staffed largely by officers, whereas civilian members of the faculty predominate in the English, History, and Government Department, and in the Modern Languages Department.

Members of the Naval Academy faculty participate in local and national meetings of educational and professional societies. As scholars and researchers they contribute to the advancement of knowledge in their disciplines. Their work and research are carried out both at home and abroad. This enriched academic background enhances their professional qualifications as leaders and as teachers of midshipmen.

A complete listing of Naval Academy faculty, by departments, is given on pages 219 through 244.


Civilians provide teaching experience

The Academic Program

The Schedule of Instruction

The calendar year for each Naval Academy class is divided into two semesters and a summer term. The academic year consists of the first and second semesters, each semester generally consisting of 16 weeks of instruction and a week of examinations. Midshipmen normally carry about 18 semester hours of academic courses. The normal academic routine provides for 5½ days of recitations, lectures, laboratory periods, and drills each week. Academic days are divided into six periods of 50 minutes, Monday through Friday, and four periods on Saturday morning. During the seventh period in the fall and spring, the Brigade participates in military drill on Monday and a dress parade on Wednesday. An evening study period is provided every evening except Saturday. Some periods during the day are also allocated to study.

The instructional unit is a section of 12–20 midshipmen. These small sections give each midshipman an opportunity to ask questions and to take an active part in classroom discussion. A high ratio of instructors to students normally makes it possible to assign no more than three or four sections to an instructor. Individual attention is thus characteristic of education at the Naval Academy.

Grading

In September 1963, the Naval Academy converted its traditional 4.0-based numerical grading system to the letter-grade system wherein individual letter grades of A, B, C, D, and F (A denoting excellent and F, failing) are assigned numerical Quality Point Equivalents (QPE) of 4.0, 3.0, 2.0, 1.0, and 0.0, respectively.

Grades are averaged using a weighted semester hour system called a Quality Point Rating (QPR). The QPR is computed by multiplying the

QPE corresponding to the letter grade received in each course by the semester hours of credit for the course and dividing the sum of these products by the total number of semester hours represented by all of the courses taken. A semester QPR is computed only for courses taken during a given semester. A cumulative QPR is maintained for each midshipman. It includes all academic marks assigned to date. This grading system is similar to that used by most colleges and universities. A cumulative QPR of 2.00 or above is required for graduation and commissioning.

An academic probation system provides warning for midshipmen who are not making satisfactory progress toward graduation. If a midshipman's cumulative QPR is below 2.0 at the completion of a semester, he is placed on academic probation for the following semester. Midshipmen are also placed on probation for the semester following any two consecutive semesters that their semester QPR is below 2.0, even though their cumulative QPR remains above 2.0. In addition, a special letter of warning serves to alert midshipmen whose mid-semester academic records are adjudged not satisfactory.

It should be noted that grades received in aptitude, conduct, and physical education, and for certain professional training conducted during the summer, are not included in the computation of QPR. Satisfactory performance is required, however, and grades are assigned very significant weight in determining class standing.

A midshipman may be recommended for discharge by the Academic Board for failure of one or more required courses, failure to improve sufficiently during a probationary semester, failure to achieve a semester QPR of at least 1.5 for any given semester, and failure to fulfill probationary conditions prescribed by the Academic Board.

On the other end of the grading scale, two honor categories are available to midshipmen. The Superintendent's List honors all midshipmen attaining a minimum of 75 percent of the maximum multiple for the semester (including QPR and grades for aptitude, conduct, and physical education). No grade may be below a "C." Additional liberty is granted to midshipmen on the Superintendent's List.

The Dean's List honors midshipmen with a minimum semester QPR of 3.4 and with no failure ("F") in any academic course or other area, including professional studies, aptitude, conduct, and physical education. These "star men" may be recognized by the gold stars on their lapels.

The Advanced Placement Program

Midshipmen may be authorized to omit courses in the core curriculum which are substantially the same courses they have satisfactorily completed elsewhere before coming to the Naval Academy. This privilege, called "validation," is normally granted on the basis of an examination given by the department which offers the course for which validation is sought. Previous scholastic records are considered and candidates are encouraged to submit results of College Entrance Examination Board Advanced Placement Tests as substantiation for validation.

The Minors and Majors Program

As described under "The Academic Program," all midshipmen are required to take a minor, a selected sequence of six courses (electives) in one of the disciplines shown below. The majority of these programs may be expanded into a major in the same discipline through the completion of additional courses. Minor and major disciplines offered are listed below by department.

Department	Minors/Majors
Engineering Department	Aerospace Engineering Mechanical Engineering Naval Engineering *Naval Architecture Option (minor only)* *Marine Engineering Option (minor only)*
English, History, and Government Department	History Literature Foreign Affairs Politics and Economics
Mathematics Department	Mathematics (minor only) Applied Mathematics (major only) Theoretical Mathematics (major only)
Modern Languages Department	French German Italian Portuguese Russian Spanish
Naval Science Department	Oceanography Management Operations Analysis
Science Department	Chemistry Physics Applied Science Electrical Science
Weapons Department	Systems Engineering (Weapons)

Each midshipman is assigned a faculty counselor to assist him in selecting his electives and in planning a profitable and acceptable program for his minor and/or major. Midshipmen validating previous work are able to substitute advanced elective courses toward a selected major or field of interest. Superior students may, commensurate with their semester QPR, be authorized to carry up to three additional courses ("overloads").

Midshipmen being certified for a major must satisfactorily complete the courses making up the major and must be recommended for the major by the appropriate Head of Department.

Requirements for the Bachelor of Science Degree

In order to complete academic requirements for the Bachelor of Science degree a midshipman must complete the courses of the core curriculum (or validate equivalent college-level work), and he must complete one of the 23 minors offered. In addition, he must achieve a cumulative Quality Point Rating (QPR) of at least 2.0 (a "C" average).

In addition to meeting academic requirements for the degree, a midshipman must meet required standards of performance in the military and professional area, including professional studies, aptitude for the service, conduct, and physical education. The degree of Bachelor of Science is conferred by the Superintendent upon recommendation of the Commandant and the Academic Dean as approved by the

Trident Scholars

The Naval Academy instituted the Trident Scholar program in 1963 in order to provide a limited number of exceptionally capable students with an opportunity to engage in independent study and research during their senior year. Under this program, midshipmen standing in the top 10 percent of their class at the end of the first semester of their junior year are invited to submit proposed research projects and programs of study for evaluation. Sixteen Scholars were selected in 1968.

Scholars carry a reduced number of courses, and their research thesis constitutes the major part of their academic program for the year. Each Scholar is assigned a faculty advisor who is well acquainted with the field in which the Scholar is working. Travel in connection with research is fully supported.

The program is guided by a Trident Scholar Committee, composed of faculty members whose primary duty is teaching and who have shown a special interest in scholarship and research. The Scholars, their advisors, the committee, and invited guests meet periodically at formal dinners for reports of progress by the Scholars and for critical discussion.

Titles of research projects of the current Scholars are "An Investigation of an Infrasonic Generator"; "Morphology and Kinetics of Precipitation in Ternary Cobalt-Base Alloys"; "France and NATO: The Development of a Political Policy"; "Construction of a CO_2 Laser and Amplifier System"; "The Reliability of Graphs"; "Stress Raisers in Glass-Hulled Deep Submergence Vehicles"; "Application of Babinet's Principle to Near-Field Diffraction of Microwaves Through Complementary Screens"; "Application of Wandering Ellipse to Optimum Intercept"; "Atomic Excitation by Electron Bombardment"; "Development of Precipitation-Hardenable Cobalt-Base Alloys"; "Charge-Compensation Effects of Rare-Earth Ions in Calcium Fluoride"; "Determination of the Performance Parameters of Highly Flexible Rotor Blades"; "A Calculation of the Decay Constant for a Three-Dimensional Potential Barrier"; "Investigation of Linac Methods of Photonuclear Florine Activation"; "An Experimental Investigation of Turbulence at the Wall of a Pipe"; and "A Series Truncation Analysis of the Hypersonic Leading Edge Problem."

Immediate Graduate Programs

Under the Immediate Graduate Education Program, now in its third year, midshipmen who have completed requisite graduate-level studies at the Academy as undergraduates may be selected to continue their studies at graduation to the master's level at participating civilian universities or at the Naval Postgraduate School in Monterey, Calif.

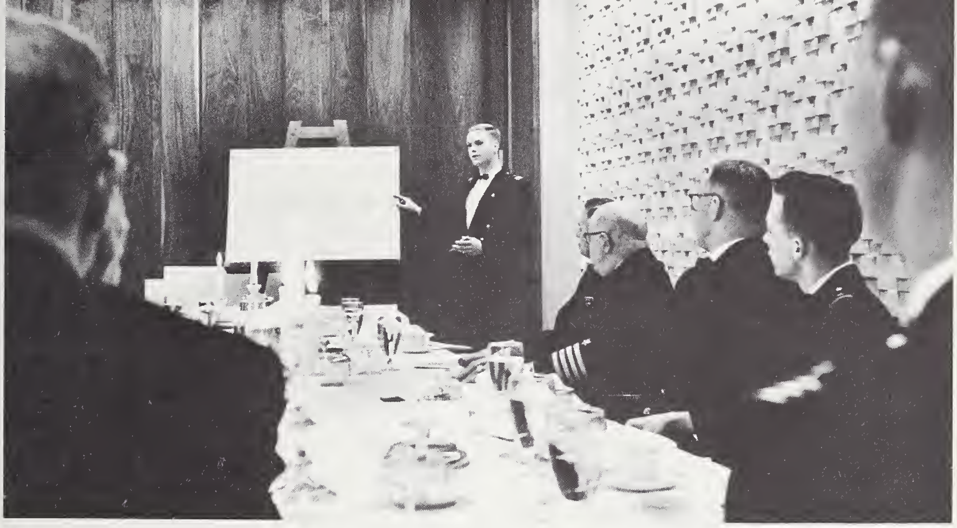
Master's degrees are attained in 9–12 months under this accelerated program. The initial group of 39 graduates undertook studies in mathematics and in mechanical, naval, and aerospace engineering. The second group, 81 graduates from the Class of 1968, were candidates for master's degrees in the fields of Economics, Operations Research, Management, Electrical Engineering, Chemistry, Physics, Applied Science, Electrical Science, Systems Engineering, and Engineering Mechanics, as well as in the four fields of the intial program.

Other graduates proceeding directly to graduate studies each year include midshipmen selected for Atomic Energy Commission Awards, Daedalian Fellowships, Catholic University Fellowships and Churchill, Fulbright, Guggenheim, National Science Foundation, Olmstead, and Rhodes Scholarships.

Naval Academy Foreign Affairs Conference

Now an eagerly awaited April event, the annual 4-day Naval Academy Foreign Affairs Conference has been an unqualified success since the initial conference in 1961, when the subject was "United States Foreign Policy in Africa and the Middle East." Most recently, in 1968 when the subject was "Africa and the Middle East," this key and complex area in world affairs was again the conference focal point.

At these conferences, distinguished civilians, military leaders, representatives of the U.S. Department of State, and ambassadors and other senior foreign diplomats and embassy personnel, join with midshipmen of the Naval Academy's Foreign Relations Club and with student representatives from more than 100 colleges and universities in a detailed study of U.S. foreign policy in the area selected for discussion. Keynote speakers are distinguished leaders in their respective fields.



A Trident Scholar discusses his research

Conferees are divided into groups for roundtable discussion of subareas. Roundtables are moderated by an adult specialist in the subarea. To provide additional background to conferees and to assist them in their discussions, conference schedules include addresses in plenary session and a panel discussion, all by outstanding figures. In addition, ambassadors or other ranking diplomats discuss their country's views with each roundtable.

Resolutions adopted by each are designed to deal effectively with U.S. foreign policy problems in their subarea. Deliberations culminate in a final plenary session in which these individual resolutions are debated, amended, and adopted.

Conferences are planned and organized by midshipmen of the Naval Academy's Foreign Relations Club under a director from the faculty and assisted by members of the faculty of the English, History, and Government Department. Financial support is provided by private foundations and corporations.

Invitational Debate Tournament

In February 1969 the Naval Academy Forensic Activity hosted the Academy's eleventh annual Invitational Debate Tournament, long considered by many universities as a highlight of their debate year. Sixty-four of the nation's top debate teams representing every geographical region of the country participated in the tournament, debating the national topic: "Resolved: The executive control over foreign policy should be significantly curtailed."

The Library

The Naval Academy Library provides broad support to the academic program. In addition to support for the Academy's scientifically oriented curriculum, the Library includes strong sections of basic works of reference and periodicals and source materials in history and literature and in the humanities generally. The Library is especially rich in military source material and has assembled one of the largest collections of naval books in the United States.

Midshipmen make extensive use of the Library for study and research and for recreation. Convenient facilities for the use of microfilm and other miniaturized textual reproductions for reference are available. The Main Library is located in Mahan Hall, with a nearby Annex for government documents, periodical holdings, and back files. Also nearby, in Isherwood Hall, is the Science-Technology Library. Construction of a new and expanded library has been approved under the Academy's current building program.

The Brigade Library, located adjacent to Bancroft Hall, is a recent and handsome addition to Academy library facilities. Open nightly until midnight, it contains a selected collection of books and magazines, excellent taping and playback equipment for recorded sound and music, and extensive display cases for special exhibits.

Educational TV

Educational TV is playing an increasingly vital role in education at today's Naval Academy. The Weapons Department has had a pilot classroom installation, supported by a departmental TV studio and staff, for the past three years. And TV is utilized extensively in experimental classrooms as part of the Academy's broad multi-media educational research program.

A major step toward early achievement of Academy-wide capability was taken during the 1968–69 Academic Year with the opening of a Central TV Studio in the new science building, Michelson Hall. This studio currently provides a complete range of color and black-and-white educational TV services to classrooms and laboratories of the new science and mathematics buildings. During the next few years, as new buildings are completed and old ones rehabilitated under the Academy's Master Plan, these TV services will become available in buildings, laboratories, and classrooms throughout the Academy.

The Academic Computing Center

The Naval Academy's Academic Computing Center is also on the move—in classrooms and laboratories, in research for the improvement of Academy instruction through educational technology, and, with private industry and the U.S. Department of Education, in the development of the nation's most sophisticated multi-media approach to the teaching of college-level subjects.

The Center's general-purpose IBM 1130 and IBM 1620 computer systems provide hands-on-time for both midshipmen and faculty. Both

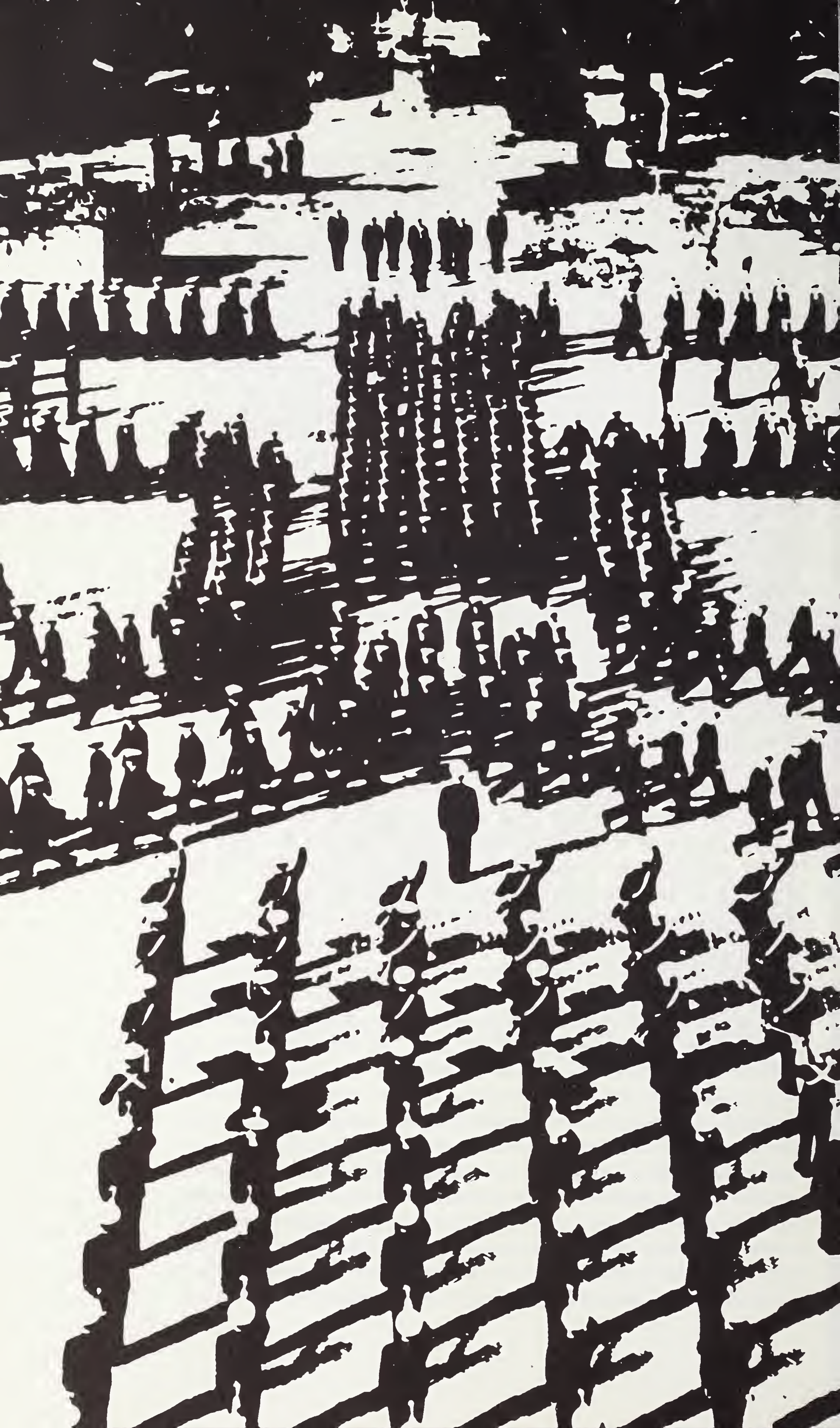
Main Library steps

systems are equipped with disc storage to allow for a full range of library and utility routines. The primary language is FORTRAN, although machine language assemblers are available. Computer usage ranges from the computation of an assigned classroom problem to the support of special research projects of midshipmen and faculty or of the Center itself. Expertise and guidance are provided to departments and to individual users by personnel assigned to the Center. In addition to services within the Center, services from the Center and from time-sharing computers in Washington, D.C., are available at each of the Academy's academic departments through remote terminals.

Three separate research projects involving the improvement of instruction through educational technology are currently well underway at the Naval Academy. The most recent and extensive is a multimedia research effort of national interest, financially supported by the U.S. Office of Education. Under this pioneering three-year project, the Academy has contracted with industry for the design, development, fabrication, installation, and validation of three pilot college-level courses using a multi-media approach: General Physics, Economic Analysis, and Introduction to Psychology and Leadership. Faculty and midshipmen, personnel of the Academic Computing Center, and consultants from industry, higher education, and government are participating. The full media spectrum is being coordinated: computers, programmed instruction, closed-circuit TV, movies, slides, audio, written materials, laboratories, lectures, and, of course, computer-assisted instruction (CAI).

A second project under development and evaluation at the Academy involves the use of remote teletype terminals by students for computer-assisted instruction. Teletype units, installed in an experimental 10-man classroom and in a number of other academic areas, are connected to a time-sharing GE computer in Washington, D.C. This Academy-sponsored program is currently limited to science and engineering materials, both classroom and laboratory, and a relatively few midshipmen. Areas under investigation include simulation of real systems, reduction and formulation of laboratory data, tutorial instruction, drill and review, and testing. Electrical Science, General Physics, Mechanics of Materials, and an Aerodynamics Laboratory course are under development.

A separate multi-media approach to computer-assisted instruction is under investigation by the Naval Academy in a third project employing an IBM 1500 Instructional System. Two experimental classrooms are in use, each with 12 remote student terminals. Instructional material is individually presented at each of these time-sharing terminals on a cathode ray tube which displays text and simple graphics. A keyboard and a light pen provide for student response, while an image projector provides for automatic display of reference materials. There is also a closed-circuit television receiver at each terminal as well as a random-access audio receiver controlled by the 1500 System. Approximately 200 midshipmen have received instruction under this program to date, the majority on a regular basis during the 1968–69 Academic year. Courses under development and evaluation by the Academy's faculty, assisted by the Computing Center staff, include Thermodynamics I, Modern Physics, Basic Russian I, General Chemistry I, Naval Operations Analysis, and Linear Systems Analysis.



The Military and Professional Program

The Commandant of Midshipmen

The Commandant of Midshipmen commands the Brigade of Midshipmen. He develops its character; endeavors to instill the highest ideals of duty, honor, and loyalty; provides military indoctrination and physical development; and inculcates midshipmen with the high standards of performance required of midshipmen and officers of the Naval Service. In carrying out these responsibilities, the Commandant coordinates the functions of the Executive, Physical Education, Medical, Dental, and Midshipmen Supply Departments.

The Executive Department

Headed by a senior naval officer, officers of the Executive Department work directly with the Brigade. Assigned duties in Bancroft Hall as battalion, company, and staff officers, they work and live in close daily contact with the midshipmen. Here by precept and example, the application of sound techniques of leadership, counsel and guidance, and, when required, corrective or disciplinary action, the midshipman is measured, molded, and motivated for the day when he will join the Fleet as an officer worthy of those who have gone before him.

The Brigade and the Military Program

The military and professional programs at the Naval Academy set it apart from most other institutions of higher learning. Designed to produce naval officers and not just college graduates, the Academy has a broader mission. True, a sound education is an essential goal, but also essential in the evolutionary process of producing naval officers is the development of character, professional knowledge, leadership ability, motivation, moral strength, and physical skills and stamina. Thus, challenging and greatly rewarding in many ways, life at the Academy is purposeful, disciplined, and military.

For purposes of military training and administration, the 4,200-man Brigade of Midshipmen is divided into two regiments, each divided into three battalions. The six battalions are each divided into six companies. Midshipmen of all four classes are assigned to each basic military unit. The company is the basic unit for numerous competitive activities during the year.

Each of these military units from the Brigade down to the 36 companies and their subordinate platoons is under the command of a First Classman, assisted by his midshipman staff and assistants. Midshipmen are selected by officers of the Executive Department for these commands and staffs in recognition of their leadership and officer-like qualities.

The Honor Concept

The Naval Academy Honor Concept is broad and general rather than specific and detailed in nature. It is predicated on the belief that each midshipman must, based on guidelines or principles, learn to make his own decision about what to do or say in any situation. Honor Concept principles are:

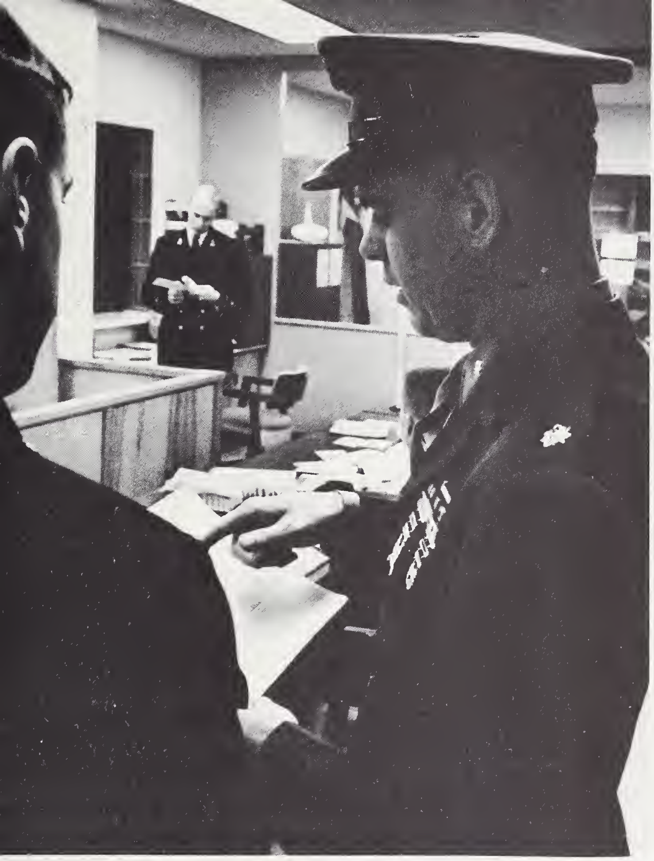
☐ A midshipman will not lie, cheat, or steal, nor will he mislead or deceive anyone as to known facts. A midshipman will be truthful, trustworthy, honest and forthright at all times and under all circumstances.

☐ Every midshipman is presumed to be honorable at all times and to possess moral integrity in the fullest sense and will be treated accordingly, unless he proves otherwise by his words or actions.

☐ A midshipman should neither permit nor accept anything which is not just, right, and true. He should do the right thing because it is right, not because of fear of punishment.

The Naval Academy Honor Concept further defines violations of these principles by lying, cheating, stealing, or misleading or deceiving, as intentional and deliberate acts.

The above guidelines should be the basis for a midshipman's conduct in all places and under all conditions, whether official or personal in nature. The Honor Concept is therefore an all-pervading way of life rather than a set of regulations for which violators will be punished.



Midshipmen watchstanders learn under expert supervision

In that the Honor Concept is a *concept*—with broad and general guidelines or principles rather than a code of specifics—an individual moral responsibility becomes the personal obligation of every midshipman. Each midshipman, therefore, must know and understand the need for the Honor Concept, its principles, and its application. Then, in the situations which he encounters daily, he should, by conscious deliberation or by force of habit, make the decisions or take the actions that are consistent with Honor Concept principles.

The Honor Concept is the responsibility of the Brigade of Midshipmen. It is administered through a Midshipmen Honor Organization of elected officials from each class who are charged with both Brigade indoctrination and the processing of honor violations. Emphasis is on indoctrination, with a minimum of one seminar or discussion per month conducted by honor representatives in each company utilizing a Brigade-wide outline. However, violators of the Concept, if found guilty by the Midshipmen Honor Organization and so reported to the Commandant of Midshipmen, may be recommended for separation from the Naval Academy.

A dishonorable act must not be excused because of "classmate or unit loyalty." A midshipman observing another in a dishonorable act may report the incident to the Midshipmen Honor Organization directly, or he may prefer to reaffirm his observations and gain the offender's viewpoint through personal questioning prior to reporting him, or choose to caution the offender personally. A midshipman who observes an honor offense and does not take any of the above actions, has not been dishonorable and committed an honor violation himself, but he has failed in his responsibility to the Honor Concept and to the Brigade.

Plebe Indoctrination

The incoming midshipmen are officially designated Midshipmen Fourth Class, but are colloquially known as "plebes". In succeeding years they become Third Classmen or "youngsters", Second Classmen, and finally, in their senior year, Midshipmen First Class.

The new midshipman undergoes an intensive and unabated program of military training and indoctrination from his first day at the Academy until the end of Plebe Year the following June. Demands upon him and his spare time seem never-ending. Known as Plebe Indoctrination, each midshipman quickly learns during this period that he is subordinate to everyone, under close scrutiny and guidance continually, and subject to many forms of correction and pressure, both mental and physical. Plebe Indoctrination is administered by midshipmen of the First Class, assisted by the Second Class, and closely supervised by the Commandant and the officers of the Executive Department.

Although some form of military training is found at many American

colleges and universities, the rigorous challenges of a plebe indoctrination system are unique to the Service Academies. Complementing other phases of midshipmen training and education, the system directly supports the Naval Academy's mission by developing leadership abilities and a basic understanding of military relationships and the military environment. Its aim is to teach each plebe to:

Exercise self-discipline,
Effectively organize his time and effort,
Perform efficiently under stress,
Think and react quickly with good judgment,
Exhibit an exemplary military bearing and appearance.

Plebe Year is tough! It is a deliberate period of testing, requiring a midshipman to stand on his own two feet, to produce under pressure, to respond promptly and intelligently to orders and, finally, to measure up to the highest standards of character, honor, and morality.

There are many aspects to Plebe Indoctrination. Plebes must maintain a rigid posture (brace-up) while eating in the messhall, must double-time at all times when in the confines of Bancroft Hall, and are responsible for being ready to answer a wide variety of professional questions during meals. Questioning is conducted by members of the two senior classes. A plebe is last to serve himself in the messhall, may not use certain stairways, walks, and areas of the Academy, and, in general, has far fewer privileges than other midshipmen.

For minor infractions of discipline, deficiencies in personal appearance or performance, a plebe may be required to report to his squad leader's room prior to meal formations to receive constructive correction. If the plebe does not respond to this form of correction, his case may be referred to a Company Performance Evaluation Board which may assign punishment or take other appropriate action.

Following March spring leave, the Midshipman Brigade Commander may declare an early end to Plebe Indoctrination when, in his judgment, members of the Fourth Class have met the test and thus demonstrated that they are fully ready to be accepted as members of the Brigade. Although applied, generally, to the entire Fourth Class, individual members of the class who have not fully measured up may be required by their company commander to continue under indoctrination through June Week, the official end of Plebe Year.

The Military and Professional Program

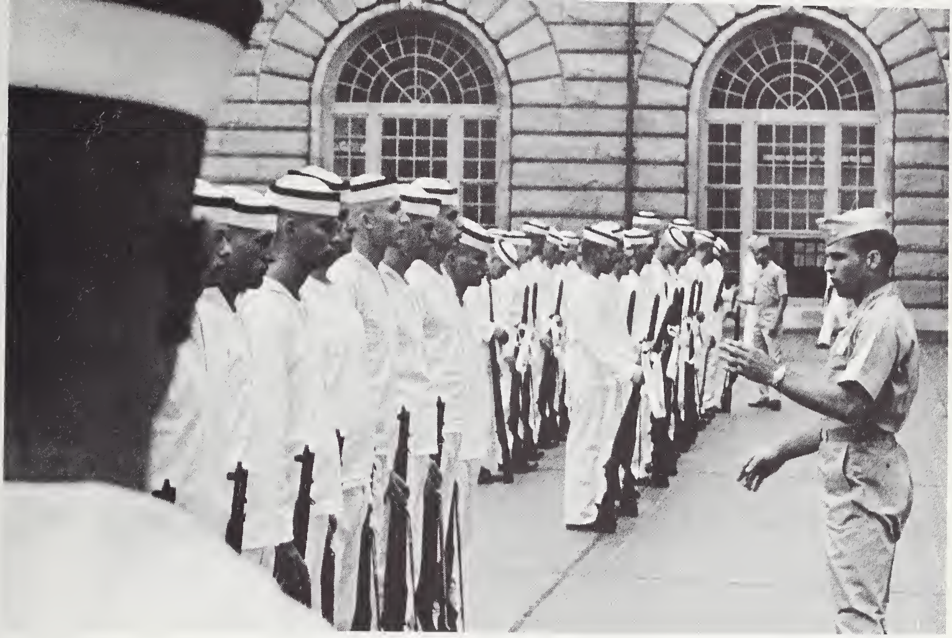
Weekly Routine

The weekly routine for a midshipman gets off to a rousing Monday-morning start with 6:15 reveille. Thirty minutes later, shaven and smartly dressed, he is undergoing his first inspection of the day at breakfast formation. After breakfast he straightens up his room and gets ready for his 7:55 class, beginning a day of recitations, drills, laboratory work, recreation, and study.

Morning classes end at 11:45 and the midshipman gets ready for noon meal formation, a daily military highlight. Shoes are sparkling, gold is shining, and uniforms are brushed and smartly pressed.

Following lunch and a few moments of relaxation or last-minute study in his room, the midshipman departs for his 1:15 class. Classes end for the day at 3:05. Shortly thereafter uniforms have disappeared, and a frenzy of activity seems to erupt simultaneously at athletic fields, gymnasiums and other indoor athletic facilities, on nearby waters of the Severn River and Chesapeake Bay, and at extracurricular facilities . . . literally at every point of the compass. Easily the best part of the day for most midshipmen, this activity is ended too quickly by the 6:30 evening meal formation.

Following the evening meal and a brief period for relaxation, studies resume for the remainder of the evening. Taps sounds at 10 p.m. during the week, but studies may continue for limited periods until "lights out." Infantry drills and dress parades are held on Monday and



You can't do it all the first day

Wednesday afternoons during fall and spring. Thus go Monday through Friday, a lot of fun and a lot of work.

Saturday morning classes are followed by noon formation, accompanied by a rigorous inspection marking the end of the academic week. All midshipmen have liberty in Annapolis on Saturday afternoon, but many prefer to watch or participate in athletics, to sail, or to enjoy other recreational activities.

Midshipmen First, Second, and Third Class also have liberty in Annapolis on Saturday evening. Some midshipmen attend the movie in Mahan Hall (upperclassmen may bring dates). Many upperclassmen attend the scheduled "hop" or dance. Hops vary from formal during such times as June Week, Homecoming weekend, and Christmas, to informal. Music is provided by the Academy's U.S. Navy Band and, on less formal occasions, by midshipman bands.

Midshipmen attend church services on Sunday morning, either in the Naval Academy Chapel or the church of their choice in Annapolis. Sunday afternoon offers more liberty in Annapolis for the three senior classes. In addition, there is another movie in Mahan Hall. Again, upper classes may attend with their dates. Midshipmen are free to show guests around the Naval Academy and are frequently found escorting family, friends, or best girl.

The Development of Leaders

Leadership is both an art and a science. There is no doubt that some men have more flair for leadership than others. At the same time, the basic principles of good leadership are well known and long established. Thus, properly instructed and trained, every man can become a more

effective leader. The four years at the Academy provide each midshipman with the basic knowledge, guidance, motivation, and experience to become an effective leader. It all starts the first day . . .

PLEBE YEAR. The first day of Plebe Summer is one that most midshipmen remember for many years. This is not surprising. In one short day civilians have become midshipmen. They are given haircuts, issued uniforms, taught the basics of marching, and eat their first meal in the 4,200-seat midshipmen's messhall. Their military indoctrination has gotten off to a running start. But they are too busy to worry about it. Civilian ways and days soon seem far behind.

As the summer progresses, the new midshipmen rapidly assimilate basic skills in seamanship, navigation, and gunnery. Infantry drill, firing an M–1 rifle under the supervision of U.S. Marines, sailing navy yawls, and cruising in yard patrol craft make the midshipman a proudly versatile young man. Spirit and a desire to win are developed through competition in a wide range of activities, including boxing, dress parades, seamanship, and talent shows.

Plebe Summer is completed in late August with Parents' Weekend, at which time parents of the new midshipmen have the opportunity to visit the Academy and observe their sons' progress. A dress parade "officered" by the new plebes, exhibitions in sports, and the opportunity to go sailing with their sons go far to assure parents that their sons are taking their new life as midshipmen in stride.

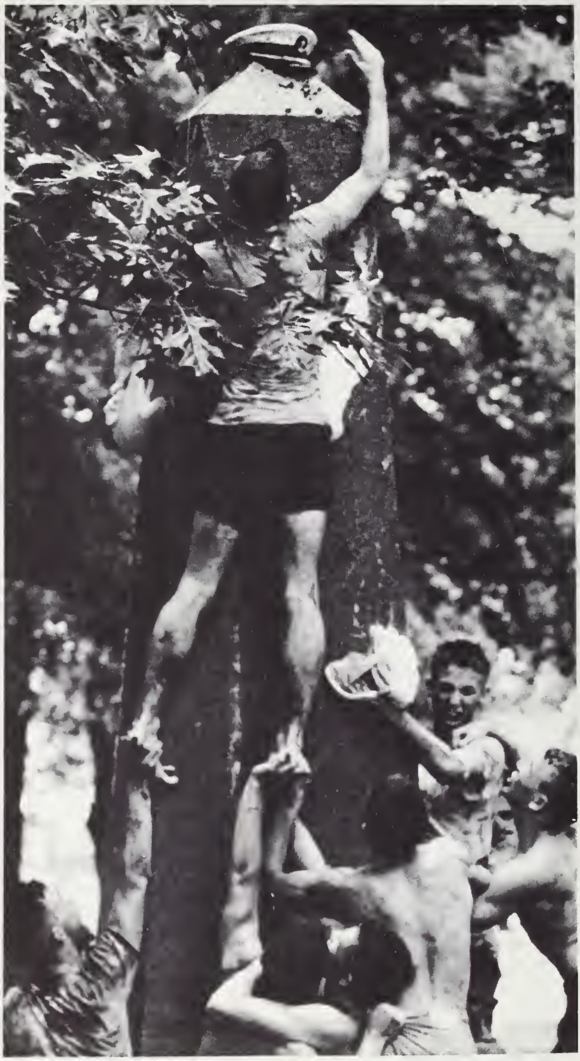
September arrives. Upperclassmen return from at-sea training, leaves, and other summer activities. The academic year gets underway. A long four years of study, hard study, lie ahead. Plebe Summer is over, but plebe indoctrination continues.

September also brings the excitement of football and other fall sports. During the football season, selected units of the Brigade travel to away games. The entire Brigade goes to home games, and to the Academy's favorite, the season-ending Army-Navy game in Philadelphia.

Christmas brings a two-week leave. Leave provides the first chance plebes have had to visit their homes since entry in June, as well as a welcome break in the academic routine for all midshipmen. Classes resume in early January, followed by semester-ending examinations late in the month. This is followed by a three-day period of leave and the start of the second semester. A final three days of leave break the academic routine during the spring.

The approaching end of Plebe Year brings mixed emotions. A feeling of relief that it is almost over is surely one. At the same time there are well-deserved feelings of confidence and pride that the test has not proven too great. Mystery is turning to mastery.

Graduation is at one time both the high point and the ending of June Week. It is also the time decreed by tradition that the plebes must



The end of Plebe Year

place a cap on the very top of the tall polished marble spire of the Herndon Monument. This they do with a vengeance. The resulting spirited once-a-year activity at the monument provides a memorable sight for startled spectators.

THIRD CLASS YEAR. With the placing of the cap, the intensive first year of indoctrination is ended, and the new Third Classmen get ready to depart on two months of at-sea training with the Fleet, accompanied by midshipmen of the First Class. Sea training is followed by 30 days of well-earned leave.

The sea training introduces the midshipman to life at sea in the Navy. He comes to know and respect the Navy's enlisted men upon whom he will later depend as an officer. He serves in many capacities and actively participates in a wide range of shipboard evolutions.

He stands deck, gunnery, operations, and engineering watches, operates ship's boats, and exercises at general shipboard drills. He completes the "Functional Training Log" and the "Training Syllabus" for Third Classmen.

With the completion of at-sea training and summer leave, Third Classmen return to the Academy and begin their second academic year. Military, a Third Classman finds himself somewhat in between. He is too senior to be subject to Plebe Indoctrination and too junior to assist. Thus, although the new year brings him more responsibilities in infantry drills and in watch standing, the lessened emphasis on indoctrination leaves him more time for sports and other extracurricular activities. It's a welcome change.

Following the completion of academic study for Third Class Year, and their second June Week, the Third Classmen become Second Classmen and begin an interesting summer of professional studies, training and indoctrination, and 30 days of leave.

SECOND CLASS YEAR. During a fast-moving summer, the Class undertakes professional studies at the Academy, completes operational familiarization and flight instruction in naval training aircraft at naval air stations in Florida, and receives introductory submarine training at the Navy's submarine base in New London, Connecticut. Thirty days of summer leave provide a welcome change of pace. Summer training ends with amphibious training at the Atlantic Fleet's Amphibious Base at Little Creek (Norfolk) Virginia.

As the Second Class midshipmen return to the Academy to begin their third academic year, still more military responsibilities are realized. Second Class Midshipmen officers are selected and trained to direct the Brigade during periodic absences of the First Class. They are assigned more-demanding watches. An important role in the indoctrination of the new Fourth Class is undertaken by the Second Class. In addition to contributing to the development of the Fourth Classmen, this responsibility makes a vital contribution to the Second Classman's growth as a leader. There is little time for watching the calendar. And, before long, another June Week has come and passed and First Class Year is underway.

FIRST CLASS YEAR. During his last summer as a midshipman, the new midshipmen First Class again participates in at-sea training. He stands the watches and performs the duties of a young naval officer and is exposed to the social courtesies, amenities, and customs of wardroom life aboard ship. Work in navigation, watchstanding on the bridge, in Combat Information Center, and in the engineering spaces, and lectures and studies provide the background used to complete his "Functional Training Log" and "Training Syllabus" for First Classmen.

Normally, midshipmen train at-sea in foreign waters and thus are able to enjoy visits to a number of foreign ports. In 1968, training units visited such places as Japan, Hong Kong, and Hawaii in the Pacific, Rio de Janeiro in South America, Naples, Athens, and Gibraltar in the Mediterranean, and Oslo, Portsmouth, Stockholm, Copenhagen, Hamburg, and Kiel in Northern Europe.

The important responsibility assigned the First Class for directing the Brigade has been noted. Midshipmen officers lead the Brigade in parades, ceremonies, and at daily formations. They are responsible for the conduct, military smartness, and competitive records of their units. They are in charge of the midshipman watch organization in Bancroft Hall. Selection of three sets of midshipman officers during the year increases the individual opportunity for this valuable leadership experience. The third or final set of "stripers" is selected by the Commandant from the most capable midshipmen in the first two.

In attempting to carry out these demanding responsibilities, the First Class midshipman finds himself calling upon all the indoctrination and leadership principles he has accumulated during his first three years. Thus, following this final year of practical experience, graduation finds him well-prepared to assume his leadership responsibilities in the Fleet as a newly commissioned officer.

The Professional Training Program

The Commandant directs the Academy's professional training program. Designed to provide graduates with a sound foundation in the fundamental, specialized knowledge and skills required of a professional naval officer, the program encompasses a wide range of professional instruction, training, and drills.

Over 2,000 hours of instruction are devoted to providing this foundation during a midshipman's four years at the Academy. The profes-

sional training program is closely monitored, and a midshipman's performance contributes very significantly to his class standing at graduation.

Included in the program are formal courses of instruction, practical training, physical education, lectures, and a variety of evolutions and drills in which the midshipmen "learn by doing." Progressing from basic military and naval knowledge to the presentation of more advanced information and concepts, the program supports and complements both the military life within the Brigade and the professionally oriented academic courses. Thus, the Academy's professional program makes a vital contribution to the development of graduates with sound potential for future growth in the naval profession. A description of the courses, drills, and training making up the professional program begins on page 191.

Leave and Privileges

The amount of personal freedom and privilege granted a midshipman varies directly with his seniority and the degree of his authority and responsibility. A First Classman will not only have more responsibility in the administration of the Brigade but also more privileges. Midshipmen proficient in academic work and military aptitude also are rewarded with extra privileges.

There are several regular periods of leave of absence from the Academy during the year. These include Christmas leave, a period of about two weeks; end-of-term leave, a three-day break at the end of the first term in January; spring leave, a period of three days, usually in late March; and the month-long summer leave for the three upper classes.

In addition to leave of absence, midshipmen are granted liberty in the Annapolis area. Like all other privileges the amount varies with

BOGOSIAN '69

seniority and responsibility. Fourth Classmen are granted liberty on Saturday afternoons and dining-out privileges with relatives and close friends on Saturdays and Sundays. They are permitted to escort young ladies on three occasions and during June Week.

First, Second, and Third Class have liberty on Saturday afternoon and evening, and on Sunday afternoons. In addition, Second Class rate liberty on Wednesday afternoons and First Class rate liberty Friday evenings plus every afternoon. Weekday liberties begin after classes are completed for the day.

Limited numbers of weekend liberties are granted to upperclassmen. Midshipmen Third Class may take one weekend of leave each semester, Second Class midshipmen receive two each semester, and First Class receive four each semester. Additional weekends may be granted to midshipmen for noteworthy academic or other achievement.

Physical Education

In supporting the mission of the Naval Academy, the program of the Physical Education Department makes a vital contribution to the physical development of midshipmen. The program continues throughout the four years. All midshipmen participate.

The program's aims for each midshipman are to develop skill, strength, confidence, teamwork, endurance, agility, and competitive spirit; to develop useful habits of physical fitness; to develop the capability to train and instruct others; and to develop the knowledge and capability to withstand physical hardship. Equally important, the program aims to be enjoyable, to provide a "release" from the academic routine, to develop a lasting appreciation for sports in general, and to develop individual skills in "carryover" sports for enjoyment after graduation.

Things get off to a fast start Plebe Summer. Preliminary testing of posture, swimming capability, and general athletic ability is followed by instruction and indoctrination drills in boxing, wrestling, lacrosse, fencing, soccer, gymnastics, crew, golf, tennis, squash rackets, volleyball, and track.

The pace continues during the first academic year. More-advanced instruction is given in badminton, soccer, swimming, boxing, wrestling, gymnastics, golf, tennis, and volleyball. In addition, midshipmen are introduced to basketball, handball, and bowling, and are tested in applied strength, agility, swimming, boxing, wrestling, and gymnastics.

The final three years follow up basic instruction and physical tests of the first year with increasingly advanced instruction and more-demanding tests. Personal conditioning, athletic administration, and hand-to-hand combat are added to the area of instruction. For a more detailed description of the Physical Education Department, its mission and facilities, see page 196.

Medical and Dental Care

The finest medical and dental care is provided midshipmen by the Navy. Facilities in Bancroft Hall are extensive and up-to-date. Daily sick calls and periodic physical and dental examinations help keep the Brigade in excellent health. If hospitalization is necessary, there are the more-complete facilities of the U.S. Naval Hospital located at the Academy as well as those of the nearby U.S. Naval Hospital at the world-famous National Naval Medical Center in Bethesda, Md.

Legal Assistance

Midshipmen are provided professional legal advice and assistance for problems of a personal nature by the Legal Assistance Officer in his individual capacity as a lawyer. The Legal Assistance Office is located in the Administration Building.

Bancroft Hall

All of the basic facilities needed for daily living and many for recreation are found in Bancroft Hall. Press shops provide rapid service on midshipman uniforms which the tailor shops keep fitted and repaired. Barber shops manage nearly 4,000 haircuts every week. The Midshipmen's Store provides daily necessities and the place to buy an occasional gift. There are Chaplains' offices with small adjoining Protestant and Catholic Chapels.

The entire Brigade dines together in the spacious and modern midshipmen's mess hall. Here, midshipmen demonstrate their enthusiasm for the appetizing, freshly prepared meals by taking a 4000-calorie daily diet in stride.

Laundry and drycleaning services are provided. There is a cobbler shop, a post office, a library, an assembly hall, a bookstore, and the midshipmen's radio station. For recreation, there are bowling alleys, squash courts, recreation rooms, clubrooms, a photo laboratory, and a band room. And there is a language laboratory. On weekends, Memorial Hall and Smoke Hall provide attractive settings for dancing, and the Steerage, or soda fountain, offers an area where midshipmen may relax with their dates.

BEAT ARMY
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IT USED TO BE

Religious Activities

It is no mere coincidence that the beautiful dome of the Chapel at the U.S. Naval Academy rises above, and dominates, all other buildings in the Yard. Nor is it by chance that the Chapel was placed centrally in planning the buildings as they now stand. This is fitting, since our country was founded on religious principles, cherished by all faiths, which are the foundations of our ideals of freedom and responsibility.

The present Chapel was completed in 1908. An addition was dedicated in 1940, increasing the seating capacity to 2,500 and changing the basic design of the Chapel from that of the Greek Cross to that of the Roman Cross. The much smaller St. Andrew's Chapel is located directly beneath the Main Chapel.

Because we are "one nation, under God," it is most appropriate that the midshipmen who will some day become the leaders of our Navy should regularly attend Divine Worship Services. Thus, all midshipmen of the Roman Catholic faith attend Mass in the Chapel. Midshipmen of the various Protestant denominations attend the Protestant Chapel Service or the church of their choice in the city of Annapolis. The Protestant Service features an outstanding guest preacher each month. Midshipmen of the Jewish and Greek Orthodox faiths attend synagogue or church in Annapolis.

During the half hour preceding the 10:30 Morning Worship, the Naval Academy Band gives a concert in front of the Chapel. As time for services draws near, the Brigade of Midshipmen marches to Chapel to the music of the band, to be greeted and reviewed by the Superintendent and his official party on the Chapel steps.

The services, both Catholic and Protestant, are enhanced by the stately beauty of the Chapel. The Protestant worship service is interdenominational, having gradually evolved from the time of the Academy's founding into its present form. Both services begin with the parading of the Ensign and the Brigade Flag to the altar where they are dipped to the Cross, signifying our allegiance to God. This is followed by the choir marching to the chancel.

In the Protestant service, the Chapel Choir is joined by the Antiphonal Choir in the balcony. These combined choirs number approximately 300 midshipmen. The prayers, responses, and creeds are those used by Christians through the ages, but there are special Naval and Naval Academy prayers including the following Midshipmen's Prayer:

Almighty Father, whose way is in the sea, whose paths are in the great waters, whose command is over all and whose love never faileth: Let me be aware of Thy presence and obedient to Thy will. Keep me true to my best self, guarding me against dishonesty in purpose and in deed, and helping me so to live that I can stand unashamed and unafraid before my shipmates, my loved ones, and Thee. Protect those in whose love I live. Give me the will to do the work of a man and to accept my share of responsibilities with a strong heart and a cheerful mind. Make me considerate of those intrusted to my leadership and faithful to the duties my Country has intrusted in me. Let my uniform remind me daily of the traditions of the Service of which I am a part. If I am inclined to doubt, steady my faith; if I am tempted, make me strong to resist; if I should miss the mark, give me courage to try again. Guide me with the light of truth and keep before me the life of Him by whose example and help I trust to obtain the answer to my prayer, Jesus Christ our Lord. Amen.

Sunday Catholic Mass is said in the Main Chapel at 8 a.m., with High Mass on the first Sunday of every month. A choir of approximately 150 midshipmen sings at the Sunday Mass.

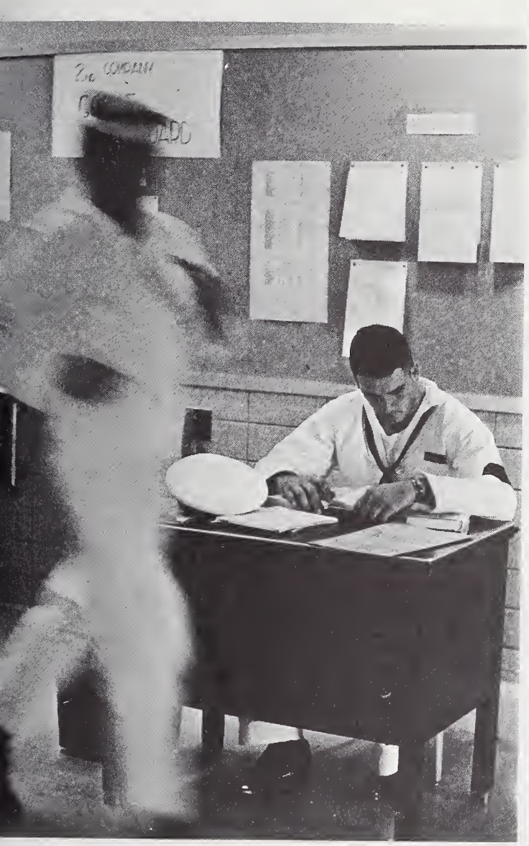
Protestant Holy Communion services are held periodically during the week at 6:20 a.m. and on Sunday morning at 9 a.m. in St. Andrew's Chapel. At 5 p.m. on Sunday evening, a brief informal service is conducted with midshipmen participating. The Naval Academy Christian Association meets on the first and third Sunday evenings of the month in Bancroft Hall. Lectures by prominent figures in the world of sports, the arts, politics, and business are followed by discussions. A Bible discussion group meets weekly and there is a Sunday school for children of civilian and military personnel taught by midshipmen. At Christmas time the Protestant Choir is joined by the Hood College Girls' Choir and professional soloists in presenting Handel's "Messiah." A Chapel Fine Arts Series offers outstanding concerts and stage productions.

For Catholic midshipmen, Mass is said daily in Bancroft Hall, Monday through Saturday. Confessions are heard daily before Mass and on Saturday afternoon and evening. The Newman Club meets on the second and fourth Sundays to discuss various dogmas of faith and aspects of the Church in the modern world. Guest speakers are featured. An annual Lay Retreat is sponsored by the Club.

Protestant and Catholic services are held each Sunday at the Naval Academy Hospital, and patients are visited periodically.

Chaplains are always available for counseling at their offices in the Chapel and in Bancroft Hall. They welcome the opportunity to meet with parents and join them in the hope that the faith of their sons will grow and flourish during their years at the Naval Academy.

Life of a Midshipman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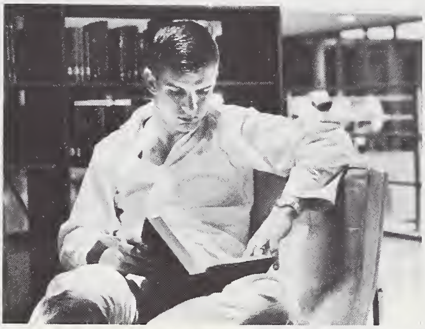


Academic Departments and Programs

Following is a brief description of each of the Academy's seven academic departments. Included are faculty, mission, facilities and academic programs, as well as a listing of course descriptions for each department.

Courses are represented by a letter prefix followed by a three-digit number. The letter prefix identifies the department offering the course. All core courses begin with number 1, 2, 3, or 4. With minor exceptions, the first digit of a core course indicates the year offered; i.e., 1 the first (fourth class) year, 2 the second year, etc. Electives, with minor exceptions, begin with any number from 5 through 9. Seminar and research-type courses begin with a 9. Letter suffixes used with modern language courses are self-explanatory.

Engineering Department

Head of Department: Captain R. W. King; **Executive Officer:** Commander R. W. Lancaster; **Senior Professor:** R. D. Mathieu; **Professors:** R. M. Johnston, A. E. Bock, W. J. Battin, V. J. Lopardo; **Commanders:** J. W. Organ, D. F. Wagner, J. B. Poland, P. B. Wyckoff, J. V. Jolliff; **Associate Professors:** W. F. Eckley, J. H. Smith, R. F. Latham, W. A. Barr, A. M. Alwan, J. E. Losure, H. C. DeMart, R. A. Granger, B. H. Rankin, W. M. Lee, E. E. Dodson, B. Johnson, A. A. Pouring, V. V. Utgoff, J. A. Adams, R. W. Werlwas, B. H. Carson, J. P. Uldrick, P. R. Van Mater, D. F. Rogers, R. A. Hirsch, C. O. Heller, M. E. McCormick, P. Van der Werf; **Lieutenant Commanders/Majors:** R. A. Kelley, H. W. Jones, W. R. Osgood, W. W. Miller, H. E. Robertson, K. P. Garland, H. B. Bartels, T. Gibbons, R. A. Lowery, C. E. Giese, Jr., M. D. Tuft, J. K. Williams, E. R. Kuhn, T. G. Henderson, T. W. Habermas, M. E. Clark, J. R. Groves (USA), C. S. Lee (USAF), L. D. Brugh (USA), R. H. Strand (USMC); **Assistant Professors:** L. M. Billow, W. B. Huckenpoehler, P. F. Wiggins, W. H. Schulden, H. H. Keith, J. O. Geremia, K. F. Read, C. Wu, R. H. Compton, T. W. Butler, R. D. Wyckoff, J. C. Gebhardt; **Lieutenants/Captains:** G. H. Lindsay, D. R. Hand, H. F. Kramer, L. R. Miller, T. R. Dyer, D. A. Orriss, J. C. Eller, R. S. Hadbavny, D. S. Diehl, H. D. Sullivan (USMC); **Lieutenants (j.g.)/1st Lieutenants:** R. J. Armstrong, D. S. Ensign, J. K. Monroe, S. L. Passman (USA).

Mission

The mission of the Engineering Department is to provide midshipmen with a course of study designed to give them an understanding of basic engineering concepts, to teach them to approach problems in an orderly and analytical manner, and to develop naval officers who will use this knowledge as a basis for sound professional judgment and decisions. The Department provides the theoretical and practical engineering knowledge required of all midshipmen to pursue a successful naval career as well as the opportunity for interested midshipmen to undertake additional studies in depth in the fields of Aerospace, Mechanical, and Naval Engineering. Four core courses and 43 elective courses are offered. Professional applications of engineering are stressed during summer at-sea training with the Fleet.

Facilities

Teaching facilities, other than standard classrooms, include several special-purpose rooms. Four design rooms are used for drawing and design courses. Eight lecture rooms, seating from 30 to 200 men each, have a total capacity of 680. A computer-aided instruction room with 10 remote terminals provides time-sharing with computer facilities in Washington, D.C. Model rooms displaying cutaways of current Navy ships and aircraft, include cutaways of power plants, engines, and equipment. Models of ships and power plants of historical interest are also featured.

Aerospace Engineering Facilities. The 14 elective courses offered by the Department's Aerospace Engineering Division are supported by the following laboratory facilities:

SUBSONIC WIND TUNNELS. Two subsonic closed-circuit wind tunnels are provided. One is powered by a constant-speed electric motor geared to a modified, variable-pitch aircraft propeller. It is equipped with a pyramidal strut-type electric beam balance system. Maximum velocity through the 2½′ x 3½′ test section is 225 miles per hour. There is a 77-seat amphitheater for observation of demonstrations and tests.

The second wind tunnel has a test section 38″ x 54″ with a maximum velocity through the test section of 150 miles per hour. It is equipped with a six-component balance system and applicable instrumentation and controls.

GASDYNAMICS LABORATORY. This new laboratory was completed in the spring of 1968 to further physical understanding of the fundamentals of compressible and incompressible fluid flow. Both steady flow and non-steady flow devices are available for laboratory experiments and demonstrations and for special research projects.

A subsonic turbulence wind tunnel, producing either a uniform flow of air or a specified level of turbulence in its test section, provides insight into the nature and origin of non-uniform flows. In addition, a variable Mach number supersonic wind tunnel, of the blow-down or periodic type, is available for the study of supersonic flow. The Mach number of this one-inch tunnel can be varied from 1.5 to 4.0. Pressure measurements and Schlieren photographs allow the student to calculate basic flow parameters and to visualize shock patterns. A large supersonic wind tunnel, operating continuously with a single-stage ejector drive, is used for demonstrations and for research on condensing or reacting gases.

A small helium tunnel driven by a five-stage ejector system provides for the study of hypersonic flows, extending the range of experimental coverage in the laboratory from Mach 4 to a Mach number of about 10. In the area of non-steady flows, a one-inch by three-inch shock tube is available. Shock interactions on surfaces, such as those produced by an explosion, can be studied using this apparatus with optical observations.

A variable-speed water table provides for simulations of low and high-speed flows. Extensive instrumentation available includes a hot-wire anemometer, recorders, pressure transducers, electronic counters, etc.

AEROSPACE STRUCTURES LABORATORY. This laboratory includes a photoelasticity area consisting of a polariscope and associated equipment for static and dynamic experimental stress analysis of components of flight structures systems.

CLASSROOM DEMONSTRATION DEVICES. Three portable wind tunnels are available for classroom demonstrations of various aerodynamic phenomena. A smoke tunnel is used to demonstrate flow of streamlines over an airfoil section.

Mechanical Engineering Facilities. The two core and 12 elective courses offered by the Department's Mechanical Engineering Division are supported by the following laboratory facilities:

MATERIAL SCIENCE LABORATORY. This laboratory provides facilities for study of the microscopic and submicroscopic structure of such materials as metals, plastics, ceramics, both singly and in combination. These studies contribute understanding of the internal structure of such materials and aid in predicting the influence that internal structure has on their physical and mechanical properties. Facilities include a 20-man lab-classroom space for demonstrations and three related adjacent laboratories: an x-ray lab, a polishing lab, and a physical metallurgy lab.

DYNAMIC AND PHYSICAL SYSTEMS LABORATORY. This laboratory is designed and equipped to demonstrate basic concepts involved in mechanical vibrations and system engineering. It also provides for experiments and research in the measurement and analysis of dynamic phenomena. The laboratory contains several types and sizes of systems for the excitation and control of vibrations: a sine-random excitation and measuring system, an electronic stroboscopic system, and frequency analysis instrumentation and display systems. Also included are various types of dynamic sensors, signal-conditioning equipment, and data-readout and display equipment. A holographic system with both continuous wave and pulse laser capability is used for demonstrating various types of recently developed coherent optic techniques.

The laboratory also has equipment, principally electronic, for solving the linear system identification problem by generation of impulse, step, sinusoidal, and random inputs and measurement of the associated outputs. This equipment is used for design and experimentation with automatic, mechanical, and electronic control systems.

SOLID MECHANICS LABORATORY. Six laboratory cells, designed and equipped to accommodate up to 20 students per cell, provide for investigations into the behavior and constitution of solid materials subjected to various environmental loadings. Equipment includes Universal testing machines, impact testers, hardness testers, photoelasticity equipment, heat-treating furnaces, strain-gage instrumentation and accessories, and related devices for ascertaining structural behavior as applied to tension, torsion, flexure, and stability.

FLUID DYNAMICS LABORATORY. This laboratory supports research in both basic and applied experimental fluid dynamics. The facility is equipped with the world's largest vortex generator for the study of steady and unsteady rotational flows. Studies in geophysical vortices, water spouts, and bath-tub vortices are investigated by use of this generator. The device is also used in designing vehicles and components that rotate in water. Additional facilities are available for study of compressible boundary-layer flow, jets and jet interaction, and fluid-borne noise. Capabilities in fluidics are under development.

MECHANICAL DESIGN LABORATORY. Mechanical design projects may be undertaken by midshipmen as part of several required and elective courses. Computational, laboratory, and shop facilities of the entire Engineering Department are available in carrying out these projects. Design space and equipment along with technical data files and a supply of precision components are also available.

Naval Engineering Facilities. The two core and 23 elective courses offered by the Department's Naval Engineering Division are supported by the following laboratories:

SUBCRITICAL REACTOR. This laboratory features a subcritical reactor containing 2,500 kg of natural uranium surrounded by light water and excited by a neutron source of five curies of plutonium-beryllium. The uranium and Pu-Be are leased from the Atomic Energy Commission. Additional laboratory equipment available includes radiation-detection devices, counters, computers, a 400-channel analyzer, and safety equipment.

FLUID MECHANICS LABORATORY. This laboratory is equipped to demonstrate basic principles involved in fluid friction, flow-metering devices, turbo-machinery, and the flow of compressible fluids. Equipment is also available to conduct exercises involving motor-driven centrifugal pumps, open-end subsonic wind tunnels and nozzles, and apparatus instrumented to determine head loss in pipes and valves.

INTERNAL COMBUSTION ENGINE LABORATORY. This laboratory includes two test cells, each capable of handling 15–20 students. Each cell is equipped with associated engine equipment, including cooperative fuel research engines, small General Motors diesel engines, 4-stroke cycle commercial gasoline engines, and small and medium-size gas turbines. Another test cell provides a soundproofed 75-seat amphitheater for demonstrations.

SHIP HYDROMECHANICS LABORATORY. The laboratory's ship model towing tank is 85′ x 6′ x 4′, of steel construction, and equipped with both powered-carriage and gravity-drive mechanisms. The powered-carriage drive is capable of speeds to 10 feet per second and carries a dynamometer to measure hydrodynamic forces exerted on the towed model. All instrument systems read out to the control end of the tank, with speeds, both visually and graphically, recorded in knots to three decimals and dynamometer forces in pounds (visually) to three decimals. A wave generator is installed which produces a unidirectional wave whose height and length may be separately controlled. Waves up to 6 inches in height and 5.5 feet in length may be generated. Special instrumentation for measuring turbulent flow in boundary layers includes three hot-film anemometers, integrating and printing digital voltmeters, a seven-channel tape recorder, amplifiers, filters, scopes, and equipment for performing spectral density analysis.

A stability tank 18′ x 22′ x 4′ is installed for stability analysis of ship models to 20 feet in length with displacements up to 2000 pounds.

A circulating water channel is available for research and instruction. This test device is used for solving complex problems involving flow around submerged and surface-piercing bodies. The water is circulated by a pump, permitting a model to remain stationary while flow conditions are being observed.

THERMODYNAMICS LABORATORY. This laboratory consists of five steam-driven, 60-kilowatt turbogenerator sets, complete with condensers and necessary auxiliary equipment. All components are instrumented so that heat balances, efficiencies, and complete performance curves can be developed for each piece of equipment. This laboratory also includes the following pieces of equipment: three two-stage, water-cooled air compressors for cycle studies, pressure-volume studies, and efficiency measurements; two 6.2-ton Freon air conditioning/refrigerating units for heat-exchange-rate experiments, cycle studies, and efficiency studies; and one concentric-ring heat exchanger for the conduct of heat-transfer experiments under conditions of parallel and counterflow.

CORE COURSES

E209	Engineering Statics and Dynamics
E210	Mechanics of Materials
E313	Elements of Thermodynamics
E314	Elements of Fluid Mechanics

MINORS PROGRAM

Aerospace Engineering

E305	Thermodynamics (in lieu of E313)
E631	Introduction to Aerodynamics
E731	Aerospace Structures I
E735	Aero Performance
E736	Aerodynamics I (in lieu of E314)
E817	Flight Vehicle Propulsion (E708 may be substituted)
M704	Math for Engineers and Physicists (M751 and M752 may be substituted)
E . . .	Engineering Elective

Mechanical Engineering

E305	Thermodynamics (may be taken in lieu of E313)
E310 or E306	Fluid Mechanics (in lieu of E314)
E601	Kinematics
E604	Intermediate Strength of Materials
E614	Engineering Materials
E701	Physical Metallurgy
E707	Mechanical Design
E . . .	Engineering Elective

Engineering

Naval Engineering

(Naval Architecture Option)

E305	Thermodynamics (may be taken in lieu of E313)
E310 or E306	Fluid Mechanics (in lieu of E314)
E608	Engineering Design Graphics
E610	Introduction to Ship Systems
E801	Naval Architecture I—Hydrostatics
E802	Naval Architecture II—Hydrodynamics
E821	Analysis of Marine Power Plants
. . . .	One technical course approved by Counselor

Naval Engineering

(Marine Engineering Option)

E305	Thermodynamics (may be taken in lieu of E313)
E310 or E306	Fluid Mechanics (in lieu of E314)
E610	Introduction to Ship Systems
E709	Reactor Physics I
E710	Reactor Physics II
E821	Analysis of Marine Power Plants
E822	Design of Marine Propulsion Equipment
. . . .	One technical course approved by Counselor

MAJORS PROGRAM

Aerospace Engineering

E305	Thermodynamics (in lieu of E313)
E614	Engineering Materials
E631	Introduction to Aerodynamics
E731	Aerospace Structures I
E735	Aero Performance
E736	Aerodynamics I (in lieu of E314)
E815	Aeroelasticity
E817	Flight-Vehicle Propulsion (E708 may be substituted)
E832	Aerospace Structures II
E837	Gasdynamics I
M704	Math for Engineers and Physicists (M751 and M752 may be substituted)
W931	Automatic Control Systems I (in lieu of W411)

Plus three of the following courses:

E702 Systems Engineering
E708 Heat Transfer I
E713 Advanced Mechanics of Materials
E744 Mechanical Behavior of Materials
E813 Continuum Fluid Mechanics
E831 Aerodynamics II
E834 Orbital Mechanics
E835 Stability and Control
E836 Aero Design
E838 Gasdynamics II
E924 Advanced Topic in Aerospace Engineering
M604 Numerical Analysis
M721 Advanced Calculus I
S821 Theoretical Physics III
W707 Digital Computers

Mechanical Engineering

E305 Thermodynamics (in lieu of E313)
E310 Fluid Mechanics (in lieu of E314)
E601 Kinematics
E604 Intermediate Strength of Materials
E614 Engineering Materials
E701 Physical Metallurgy
E707 Mechanical Design
E708 Heat Transfer I
E759 Intermediate Dynamics
E809 Mechanical Vibrations
M751 Engineering Math I
W931 Automatic Control Systems I (in lieu of W411)

Plus three of the following courses:

E501 Engineering Drawing and Descriptive Geometry
E606 Theory of Engineering Experimentation
E702 Systems Engineering
E709 Reactor Physics I
E710 Reactor Physics II
E713 Advanced Mechanics of Materials
E744 Mechanical Behavior of Materials
E810 Reactor Kinetics
E813 Continuum Fluid Mechanics
E821 Analysis of Marine Power Plants
E822 Design of Marine Propulsion Equipment
E837 Gasdynamics I
M752 Engineering Math II
W707 Digital Computers

Naval Engineering

E305 Thermodynamics (in lieu of E313)
E310 Fluid Mechanics (in lieu of E314)
E608 Engineering Design Graphics
E610 Introduction to Ship Systems
E709 Reactor Physics I
E710 Reactor Physics II
E801 Naval Architecture I—Hydrostatics
E802 Naval Architecture II—Hydrodynamics
E811 Ship Structures
E821 Analysis of Marine Power Plants
E822 Design of Marine Propulsion Equipment
M751 Engineering Math I

Plus two of the following courses:

E501 Engineering Drawing and Descriptive Geometry
E606 Theory of Engineering Experimentation
E614 Engineering Materials
E702 Systems Engineering
E708 Heat Transfer I
E715 Ship Vibrations
E810 Reactor Kinetics
E813 Continuum Mechanics
E902 Engineering Research Project
M752 Engineering Math II
W707 Digital Computers
N603 General Oceanography

Course Descriptions

E209 ENGINEERING STATICS AND DYNAMICS. *Four Sem Hrs (4–0).* A course in applied engineering mechanics using vector approach and covering the two major areas of Statics and Dynamics. Vector algebra, the concepts of force, moments, and couples, the resultants of force systems, the conditions of equilibrium and their applications to friction problems, simple structures, and trusses are covered in Statics. Definitions of displacement, velocity and acceleration, kinematics of absolute motion, kinematics of relative motion, Newton's Laws of Motion, kinetics of particles and rigid bodies using force, mass & acceleration, and kinetics of particles and rigid bodies using work and energy methods are all covered in Dynamics. *Naval Applications:* This basic course has wide and fundamental naval applications. Specific examples include ballistics of projectiles, the basis and theory of the maneuvering board, and problems involving center of buoyancy and center of pressure which find later application in studies of ship stability. More important, by introducing the student to the fundamental mechanical concepts of forces and moments and their effects on rigid bodies, the course lays the groundwork for an understanding and further study of such diverse topics as gear-train design, hull resistance vs. ship power requirements, ship weight control and its effect on ship stability, static and dynamic loading of cargo booms and ship rigging, and principles of the gyrocompasses. *Prereq: M120; Coreq: S211.*

Engineering

E210 MECHANICS OF MATERIALS. *Four Sem Hrs (3–2).* A first course in strength of materials which covers the following topics: simple stress, simple strain, torsion, shear and moment in beams, stresses in beams, beam deflection, combined stresses and columns. *Naval Applications:* With its prerequisite, E209, this course provides fundamental understanding of a wide range of structural problems commonly encountered in the Navy. These include such considerations as bending moments in ship hull girders, minimum propeller shaft diameters required for combined axial and torsional loads, and stresses appearing in cargo booms and supporting structures in response to eccentric loads. The course also introduces the student to the meaning of such common engineering terms as yield point, yield strength, factor of safety, etc., thus affording a first insight to the significance of these terms as they appear in Navy technical literature and reports. *Prereq: E209.*

E305 THERMODYNAMICS. *Four Sem Hrs (4–0).* Basic concepts and principles of thermodynamics with emphasis on universal applications. First and Second Law development. Energy equations. Reversibility and irreversibility. Entropy. Thermodynamic functions. Properties of pure substances. Reversible and irreversible processes and cycles with various fluids. Gas and vapor mixtures. *Prereq: General Physics and M215 or equivalent.*

E306 FLUID MECHANICS. *Four Sem Hrs (4–0).* A basic course in fluid mechanics which covers the following topics: fluid properties; fluid statics; basic flow concepts; basic equations, including conservation of mass, momentum, and energy; dynamic similitude, including Reynolds, Mach, and Froude numbers; and viscous effects, including the boundary layer, fluid dynamic lift and drag. *Prereq: E305 or E313.*

E308 ADVANCED FLUID MECHANICS. *Four Sem Hrs (4–0).* Second semester of continuum fluid mechanics sequence. Topics include dimensional analysis; empirical, phenominological and mathematical approaches to laminar and turbulent flow; hydrodynamic flow noise; ship and model testing; compressible flow; and a fluid mechanics design problem. *Prereq: S813.*

E310 FLUID MECHANICS. *Four Sem Hrs (4–0).* An introductory course in fluid mechanics which covers the following topics: fluid characteristics; basic equations, including continuity equation, Euler's equation of motion, hydrostatics, Navier-Stokes equation, Bernoulli equation, and momentum theorems; dynamic similitude; incompressible potential flow; flow of real fluids; and boundary layer theory. *Prereq or Coreq: E305; M751 or M704; or special permission.*

E313 ELEMENTS OF THERMODYNAMICS. *Four Sem Hrs (4–0).* Thermodynamics is a basic science dealing with the properties of substances and with the forms, transformation, and evaluation of energy. It embraces a wide field. This course is concerned with the engineering aspects of this general subject, only, and will provide the fundamental background for the processes that take place in naval power plants, internal combustion engines, refrigeration plants, compressors, nozzles and turbines, air conditioning equipment and heat transfer devices. *Naval Applications:* Thermodynamics is so fundamental a science that it encompasses operating principles of past, present, and projected naval equipment. The gas turbine, ram jet, space rocket, and nuclear power plant are all within the structure of present thermodynamic theory. Knowledge acquired in this course will enable naval officers to analyze existing equipment intelligently, to critically examine new proposals, and to understand the thermodynamic limitations imposed by nature on equipment. This analysis opportunity is presented for the student in a case problem as part of the next sequential course, E314, Elements of Fluid Mechanics, where boilers, turbines, turbogenerators, condensers and heat exchangers, air ejectors, deaerating feed tanks, and pumps are analyzed as elements of a naval ship propulsion system. *Prereq: General Physics and M215 or equivalent.*

E314 ELEMENTS OF FLUID MECHANICS. *Four Sem Hrs (3–2).* The first half of the course treats the fundamental concepts of fluid mechanics. Continuity and the equations of motion and momentum are covered. The second half of the course consists of a Case Problem which applies both thermodynamics and fluid mechanics to the preliminary design analysis of a naval turbine propulsion plant. Laboratory exercises supplement the course material. *Naval Applications:* As a means of bridging the gap between theory and practical application, a Case Problem considers the basic steam power plant of a naval vessel, examining the propulsion boilers, the propulsion turbine, condensers and heat exchangers, the deaerating feed tank, pumps, turbogenerators, air ejectors, and the distilling plant. *Prereq: E313.*

E501 ENGINEERING DRAWING AND DESCRIPTIVE GEOMETERY. *Three Sem Hrs (3–0).* An introduction to engineering graphical methods and disciplines, with emphasis on spatial visualization providing experience in creative thought and in procedures to convey ideas through graphical communications. Instruction includes the study of both abstract and mechanical forms and their representation in two-dimensional mediums by means of freehand and instrument drawing. Topical coverage includes points, lines, planes, and solids in space, with representation by orthographic, axonometric, and oblique projections. Engineering applications involve practice in detail and assembly drawings of mechanical components.

E502 BASIC GRAPHICS. *One Sem Hr (0–2).* A brief coverage of the elements of engineering graphics and descriptive geometry, with applications. Topical coverage includes use of drawing instruments, spatial reference, and visualization of points, lines, planes, and solids. The applications involve practice in drawing mechanical components.

E601 KINEMATICS. *Three Sem Hrs (3–0).* A study of displacements, velocities,

Engineering

and accelerations of machine elements. Topics include equations of motion, relative motion, linear and angular velocities, linear and angular acceleration, and normal and tangential acceleration. Instant center, Kennedy's theorem, velocity and acceleration polygons. Image method, Coriolis acceleration. Graphical differentiation and integration, slider-crank mechanism, development of plate and cylindrical cam profiles, rolling cylinder, rolling cones. Analysis of gear trains, including epicyclic gear trains. Flexible connectors. *Prereq: M111.*

E604 INTERMEDIATE STRENGTH OF MATERIALS. *Three Sem Hrs (3–0).* A second course in strength of materials which expands on the concepts in the first course and also introduces additional theory. The course covers three-dimensional stress and strain, equations of compatibility, torsion of noncircular sections, shear flow, the use of singularity functions, redundantly-supported members in torsion and bending, theories of failure, solutions by energy methods, and limit design. *Prereq: E210, M224.*

E606 THEORY OF ENGINEERING EXPERIMENTATION. *Three Sem Hrs (2–2).* A course relating the theoretical, analytical, and statistical aspects of experimental work stressing the basic similiarities common to all types of experiments. Traditional measuring devices are used to introduce the concepts and propagation of error. The treatment of experimental data, its interpretation and logical presentation, is also stressed. *Prereq: M111.*

E608 ENGINEERING DESIGN GRAPHICS. *Three Sem Hrs (3–0).* A course in engineering graphical methods and disciplines with emphasis on spatial visualization. Instruction includes the study of both abstract and mechanical forms and their representation in two-dimensional mediums as a means of providing experience in creative thought and as a method of conveying ideas through graphical communication. Both freehand and instrument drawing are emphasized. Studies include the theories of orthographic, axonometric, and perspective projection. Engineering applications involve practice in detail and assembly drawings of mechanical components and the representation of fair surfaces with special emphasis on the delination of ship's lines. *Prereq: E501 or E502, or equivalent; Coreq: E209.*

E610 INTRODUCTION TO SHIP SYSTEMS. *Three Sem Hrs (3–0).* An introductory course in naval architecture. The primary ship's systems and their relationship to preliminary design are considered. The following topics are covered: concept formulation and the design-building spiral, structural systems, shipyard practices and launching, the importance of weight control and its relation to transverse and longitudinal stability, resistance and prediction of effective horsepower, propulsion and steering, the choice and adaptation of propulsive equipment, and ship systems of the near future. *Coreq: E209.*

E614 ENGINEERING MATERIALS. *Three Sem Hrs (2–2).* An introductory course in the science of engineering materials covering metals, ceramics, and plastics. Included are atomic structure and bonding, molecular structures, crystal structures, solid solutions, crystal imperfections, solid-state diffusion, electrical properties, magnetic properties, deformation and failure of materials, modification of properties through changes in microstructure, solid-state reactions, and multiphase materials. Laboratory work includes methods of testing and evaluating engineering properties of materials, heat treating, phase transformations, and changes in composition. *Coreq: S211; Prereq: S102.*

E631 INTRODUCTION TO AERODYNAMICS. *Three Sem Hrs (3–0).* Introduction to fluid mechanics as applied to the flight vehicle. Specific areas of coverage are Newton's laws, the atmosphere, introductory fluid dynamics, aeronautical nomenclature, experimental procedures, planform and viscous effects, and introductory compressibility. *Prereq: M120; Coreq: S211.*

E701 PHYSICAL METALLURGY. *Three Sem Hrs (3–0).* A study of the principles of physical metallurgy including atomic structure, methods of studying crystal systems, imperfections in crystal structures, liquid and solid phases of metals. Thermodynamics of phase transformations, solid solution phase diagrams, non-equilibrium solidification, solid-state reactions, elasticity, mechanisms of plastic deformation, high-temperature strength, diffusion in metals, age hardening, equilibrium heat treatment, and non-equilibrium decomposition. *Prereq: E614 or S733.*

E702 SYSTEMS ENGINEERING. *Three Sem Hrs (3–0).* Concerned principally with the description and analysis of multi-variable engineering systems. Mathematical models in both time and frequency domains are studied with emphasis on the state-variable method because of its adaptability to solution by digital computer. Linear-continuous, linear-discrete, and stochastic systems are considered. *Prereq: Second Class standing.*

E707 MECHANICAL DESIGN. *Three Sem Hrs (2–2).* The student will engage in an authentic design experience by participating as a member of a 4-6 man project team. The design projects will be selected from ideas proposed by the students. The project work will be supplemented by lectures, case studies, and problem solving sessions covering selected topics from the fields of design, stress analysis, and materials. *Prereq: E604 or equivalent.*

E708 HEAT TRANSFER I. *Three Sem Hrs (3–0).* A study of the basic principles of engineering heat transfer. Topics in conduction include steady and transient conduction, internal generation, and finned surfaces. Topics in convection include free and forced-convection boundary layers, internal convection, high-speed flow, and empirical correlations. Topics in radiation include black surfaces, gray surfaces, shape factors, and gas radiation. Both analytical and numerical methods are used to analyze heat transfer problems. *Prereq or Coreq: E310 or E306 or E736; M751 or M704.*

E709 REACTOR PHYSICS I. *Three Sem Hrs (3–0).* Fundamental aspects of atomic and nuclear structures are given emphasis. Natural and induced radioactivity, laws of radioactive decay, including a demonstration of half life, binding energy and nuclear stability, compound nucleus, liquid drop model and theory of fission, cross sections, including a demonstration of total cross section, Maxwell-Boltzmann distribution of thermal neutrons, center-of-mass system and laboratory system mechanics, slowing-down density, resonance escape probability, thermal utilization factor, and the four-factor formula for k (infinite). Brief introduction to the meaning of Fermi age and diffusion length, including both the physical meaning and the mathematical derivation of these probabilities on nonfast and nonslow leakage of neutrons. Material and geometric buckling. Finally, the diffusion equation and the critical equation applied to a thermal reactor. *Prereq: M224.*

E710 REACTOR PHYSICS II. *Three Sem Hrs (2–2).* This is the second semester's work in reactor physics. The course includes work in the Subcritical Reactor Laboratory where the sub-critical (U-nat., water) reactor is located. Health physics orientation, use of foils for flux mapping, statistics, diffusion length of neutrons in water, thermal utilization factor, material and geometric buckling, and, finally, finding K(inf.) and K(eff.) for Academy's reactor. The lab work also includes gamma spectrum analysis via a 400-channel gamma analyzer, some simulation of relayed neutron step functions, xenon poisoning build-up after shutdown, and parent-daughter decay problems via the 20 amplifier analog computer. Class work and laboratory work are closely correlated. Study is made of the interactions of radiations with matter; elementary shielding considerations and the mathematical physics approach are emphasized at all times. Course concludes with a comprehensive review problem in which the various topics are functionally related to each other. *Prereq: E709.*

Engineering

E713 ADVANCED MECHANICS OF MATERIALS. *Three Sem Hrs (3–0).* A course in the area of mechanics of materials and the theory of elasticity which deals with topics not normally covered in the elementary courses of strength of materials and which, in addition, includes more rigorous formulation of stress and strain at a point. Covers the concepts of stress vector, stress tensor, strain tensor and the stress-strain relationships. The equations of elasticity are derived and the use of differential equations and the Airy stress function of solving simple problems in elasticity are included. Also covered are concept of strain energy and the use of energy methods including principles of virtual work, Castigliano's theorem, and the principle of minimum strain energy. Other topical coverage includes beams on elastic foundation, buckling of columns and the Rayleigh-Ritz method, thick-walled cylinders, rotating discs, curved beams, stress concentration, torsion of non-circular cross sections, and the membrane analogy. *Prereq: E604, M751.*

E715 SHIP VIBRATIONS. *Three Sem Hrs (3–0).* A fundamental course in the theory of vibrating systems. Application to problems encountered in ship systems are stressed. Primary emphasis is placed upon steady and transient vibrations of undamped and damped single-degree-of-freedom systems, both free and forced. The analogies, and multimass systems are also emphasized. Distributed-systems, non-linear systems, and shock are discussed. *Prereq: M704 or M751.*

E731 AEROSPACE STRUCTURES I. *Three Sem Hrs (3–0).* An application of the principles of solid mechanics to the lightweight structures of flight vehicles. Analysis of trusses, beams, frames, and thin-walled sections are included. Methods studied are virtual work, Castigliano's theorem, and least work. Loads on aircraft and spacecraft are also studied and computer-oriented solutions are stressed. *Prereq: E210.*

E735 AERO PERFORMANCE. *Four Sem Hrs (3–2).* The basic principles of areodynamics are extended to include flight vehicle analysis. Modern methods of finite wing analysis are introduced. The several types of flight vehicle power plants are described and their performance characteristics are introduced. Static performance analysis is discussed, including generalized methods, thrust and power required and available, and range and endurance. Also discussed is dynamic performance analysis, including kinetic energy and acceleration effects, landing and takeoff, energy methods, optimum rate of climb, and maneuvering flight. Static longitudinal stick-fixed and stick-free stability and control are introduced. The performance of a specific aircraft is determined as a course project. Laboratory wind tunnel experiments are included to support and supplement the theoretical analysis. *Prereq: E631.*

E736 AERODYNAMICS I. *Four Sem Hrs (4–0).* A study in perfect-fluid theory. The basic principles of aerodynamics are introduced and applied to specific problems. Topics covered include the fluid medium, kinematics of a fluid field, dynamics of a fluid field, the flow about a body, thin-airfoil theory, finite-wing theory, and an introduction to the dynamics of a viscous fluid. Laboratory work is included. *Prereq: E631; Coreq: M704 or M751.*

E744 MECHANICAL BEHAVIOR OF MATERIALS. *Three Sem Hrs (3–0).* A treatment of the mechanical properties and behavior of materials. Elastic, plastic, viscous, and viscoelastic behavior will be treated with the emphasis placed on gaining an insight into the reasons for the different types of behavior rather than mathematical rigor. Modes of failure including brittle fracture, ductile, fracture, rupture, stress corrosion cracking, creep, and fatigue will also be considered in the laboratory. *Prereq: E614; E604 or E731.*

E759 INTERMEDIATE DYNAMICS. *Three Sem Hrs (3–0).* A study in classical mechanics. Beginning with the basic kinematic and dynamic principles for a single particle, the equations of motion and their integrals of work-energy and impulse-momentum are studied. The equations of motion for a general system of particles are developed and applied to changing-mass problems which involve both linear and angular momentum, impulse and momentum for a system of particles, and energy principles for the particle system. Rigid-body kinematics are studied and the fundamental dynamic principles are applied to problems of rigid-body motion. In the latter part of the course generalized coordinates and Lagrangian methods are introduced. *Prereq: E209.*

E801 NAVAL ARCHITECTURE—STATICS. *Three Sem Hrs (3–0).* Covers the concepts and calculations involved in the hydrostatic analysis of ships. Included are numerical integration as applied to areas, volumes, and first and second moments of area. Transverse and longitudinal stability are studied at small angles of heel and trim for both surface ships and submersibles, and techniques are given to extend the study of stability into large angles of heel and trim. Stability of ships in damaged condition is studied. Each student prepares a set of hydrostatic curves of form and Bonjean curves for a given vessel. The application of digital computers to naval architectural calculations is discussed and encouraged. *Prereq: E306 or E310; E608, E610.*

E802 NAVAL ARCHITECTURE—DYNAMICS. *Four Sem Hrs (3–2).* Covers the concepts and computations involved in the hydrodynamic analysis of ships. The basic topics covered include laws of dimensional similitude, ship resistance, basic momentum theory of propulsive devices, screw propeller design, steering and maneuvering of ships, submarine dynamics, seakeeping of ships, characteristics of special craft such as planing hulls, hydrofoil vessels, and hovercraft, and the preliminary design of a ship. Laboratory exercises in the USNA tow tank and other facilities supplement recitations. *Prereq: E801.*

E805 HEAT TRANSFER II. *Three Sem Hrs (3–0).* Concerned with the formulation and solution of the linear and non-linear differential equations which arise in heat-transfer problems. The general conduction equation is analyzed for both steady and transient heat conduction using various coordinate systems. Similarity analysis is applied to the momentum, energy, and species equations appearing in convective-heat and mass transfer. Solutions are obtained by analytical and numerical methods. *Prereq: E708, M751; Coreq: M752.*

E809 MECHANICAL VIBRATIONS. *Three Sem Hrs (3–0).* A study of the fundamentals of vibration based on dynamic principles, with particular emphasis on modern techniques of analysis. A variety of analytical methods of solution are presented along with demonstrations of corresponding experimental techniques. Conceptual clarity is stressed throughout the study. Topics include free, damped, and forced harmonic vibration of linear-single and multi-degree-of-freedom systems, transient and nonperiodic vibrations, continuous systems, and random vibration analysis. *Prereq: E759.*

E810 REACTOR KINETICS. *Three Sem Hrs (3–0).* This is the third semester's work in reactor physics. The course starts out with a review of such topics as delayed neutrons, negative temperature coefficient, xenon poison buildup, and a step function change in reactivity. Ramp function changes in reactivity are then introduced. This is not a systems-control course but rather the physics of feedback control in reactor kinetics. Digital computers available at the Academy are utilized, including the remote-control system from GE. Basic as well as FORTRAN language is used. Longhand computation starts the work so that the computer's advantage is readily appreciated. Assigned work includes programming and wiring circuits for the analog computer (TR–20). Analyses of the primary and secondary loops of the PWR-type of reactor are emphasized. The course terminates with the equations for the solution of a two-group, two-region reactor core and reflector and plotting of the flux on graph paper. *Prereq: E710.*

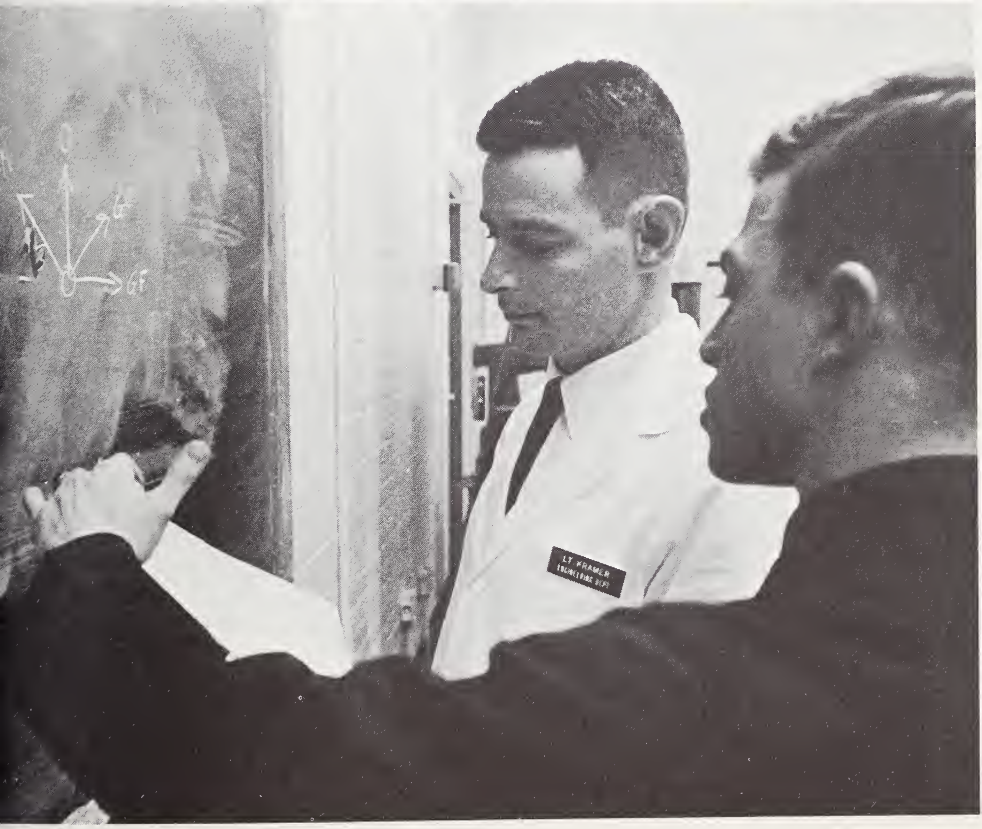
E811 SHIP STRUCTURES. *Three Sem Hrs (3–0).* A course in structural theory and practice, including longitudinal and transverse strength of the hull girder, bending moments in a seaway, development of the ship's structural design, submarine pressure-hull design, and shipbuilding materials. Case problems in structural design are studied. *Prereq: E210, E610.*

E813 CONTINUUM FLUID MECHANICS. *Three Sem Hrs (3–0).* An introduction to the mechanics of linear and nonlinear fluids. Emphasis on constructing mathematical models of real materials. Topics include matrices, Cartesian tensors, Jacobians, fluid kinematics, Reynolds transport theorem, stress, conservation of mass and energy, Cauchy and Euler equations of motion, accelerating reference frames, invariance requirements, constitutive equations for Newtonian and non-Newtonian fluids, material objectivity, rheological behavior, Navier-Stokes equations, applications to laminar and turbulent flow, and turbulent-flow noise. *Prereq: E310 or E736; M224 or equivalent.*

E815 AEROELASTICITY. *Three Sem Hrs (3–0).* Fundamentals of vibrating systems with applications to aircraft and spacecraft components. Introduction to aeroelasticity, wing divergence, control effectiveness and reversal, and wing flutter. *Prereq: E832, E736.*

E817 FLIGHT-VEHICLE PROPULSION. *Three Sem Hrs (3–0).* The principles of fluid dynamics and thermodynamics are specialized to the problems of propulsion of aircraft and space vehicles. The various kinds of flight vehicle propul-

R.J.HALLIGAN,JR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sion devices are described and their performance characteristics in the operating environment are examined in some detail with a view towards establishing optimization parameters. The analysis and design of engine components is briefly considered. *Prereq: E305 or E313, E306 or E310 or E736.*

E821 ANALYSIS OF MARINE POWER PLANTS. *Four Sem Hrs (3–2).* A preliminary design study of the machinery essential to a marine power plant. Through the use of a case problem, the student integrates the machinery component design problems into a complete marine power plant heat balance. The heat balance leads to an understanding of overall plant efficiency, steam rates, and performance. The laboratory is utilized to verify design assumptions and derive performance criteria for power plant equipment. This course gives the student an understanding of the overall design problem of a ship's machinery plant and its thermo-fluid system relationships. *Prereq: E305 or E313; E310 or E306 or E314.*

E822 DESIGN OF MARINE PROPULSION EQUIPMENT. *Four Sem Hrs (3–2).* This course covers the principles of design for boilers, turbines, condensers, and gas turbines. The student develops a detailed design of these components based upon the preliminary design requirements established in E–821. *Prereq: E821.*

E831 AERODYNAMICS II. *Three Sem Hrs (3–0).* An advanced course in aerodynamics covering the Navier-Stokes equations and the boundary layer approximations. Incompressible and compressible laminar boundary layers and convective heat transfer are discussed. *Prereq: E736, E837; permission of instructor.*

E832 AEROSPACE STRUCTURES II. *Three Sem Hrs (3–0).* Analysis of rings and frames by elastic center method. Thin-walled elements with emphasis on shear stresses. Membrane stresses in pressure vessels. Bending of thin, flat plates. Skin-stringer structural systems. Tension-field beam. Flight-vehicle materials and their properties. *Prereq: E731; Coreq: M704 or M751.*

E834 ORBITAL MECHANICS. *Three Sem Hrs (3–0).* An introductory treatment of the elements of space flight. The orbits of planets and satellites, including the suborbital and escape cases, are approached from considerations of classical mechanics. Orbital control, rendezvous and docking, and the optimization of rocket-propelled vehicle trajectories are considered. *Prereq: M224, E209.*

E835 STABILITY AND CONTROL. *Three Sem Hrs (3–0).* A subdivision of the subject of flight dynamics. The aerodynamic and inertial forces and moments acting on the flight vehicle and its parts are analyzed to determine their effect on dynamic stability. The dynamic response of the airplane to actuation of controls is considered. The flying qualities of the aircraft thus determined are then examined, and the use of stability augmentation systems as a means of improving aircraft flying qualities are studied. Finally, flight simulation devices and methods as an analytic tool are discussed. *Prereq: E735.*

E836 AEROSPACE DESIGN. *Three Sem Hrs (1–4).* Preliminary design of a flight vehicle. Includes preliminary layout, weight and balance estimates, performance analysis, stability analysis, and structural analysis. Detailed consideration is given to one aspect of the design, e.g., performance, stability, or structure. *Prereq: E731, E735.*

E837 GAS DYNAMICS I. *Three Sem Hrs (3–0).* Intended to give a comprehensive view of the methods of gas dynamics in internal-flow systems. Topics covered include thermodynamics of perfect and real gases, fundamental theorems of one-dimensional, compressible subsonic and supersonic flows, methods of flow measurement and flow visualization, nozzle and diffuser theory, normal and oblique shock waves, flow in ducts and wind tunnels, and Prandtl-Meyer flow and characteristics theory in nozzle design. *Prereq: E310 or E736; M704 or M751; E305.*

E838 GAS DYNAMICS II. *Three Sem Hrs (3–0).* Further development of one-dimensional steady and non-steady compressible flow with major emphasis placed on non-steady flow analysis. Topics include generalized methods in gas dynamics, influence coefficients, flow with viscous and thermal effects, detonation and deflagration theory, characteristics and waves in non-steady flows, shock-tube theory, pressure exchange and combustion in non-steady flows, dynamic-flow machines, and steady and non-steady thrust generators. *Prereq: E837.*

E902–903 ENGINEERING RESEARCH, DESIGN, OR CONSTRUCTION PROJECT. *Three Sem Hrs Each Term (0–6, 0–6).* A creative engineering research, design, or construction project in the student's field of interest, entailing a minimum of six hours of laboratory, shop, or design work each week. A project of sufficient scope may be continued for a second semester. *Prereq: Approval by Engineering Department Research Council.*

E904–905 ENGINEERING RESEARCH, DESIGN, OR CONSTRUCTION PROJECT. *Two Sem Hrs Each Term (0–4, 0–4).* Same as E902–903 except that a minimum of four hours of laboratory, shop, or design work is required each week. *Prereq: Approval by Engineering Department Research Council.*

E906–907 ENGINEERING RESEARCH, DESIGN, OR CONSTRUCTION PROJECT. *One Sem Hr Each Term (0–2, 0–2).* Same as E902–903 except that a minimum of two hours of laboratory, shop, or design work is required each week. *Prereq: Approval by Engineering Department Research Council.*

E924 ADVANCED TOPIC IN ENGINEERING. *Three Sem Hrs (3–0).* Selected topic of a theoretical or experimental nature which is not covered by regular courses of the curriculum and is designed to emphasize the application of advanced mathematical or design methods. More than one topic may be offered in any one semester and topics may change from year to year. Topics are announced prior to registration. *Prereq: Approval of instructor and chairman of academic division.*

English, History, and Government Department

Head of Department: Captain H. A. Cummings; **Executive Officer:** Commander R. H. Wilson; **Senior Professor:** W. W. Jeffries; **Distinguished Visiting Professor:** R. P. Ashley; **Professors:** E. B. Potter, A. S. Pitt, D. R. Lacey, J. R. Fredland, E. J. Mahoney, N. T. Kirk, J. C. Reed, W. L. Heflin, E. M. Hall, R. W. Daly, R. L. Mason, J. R. Probert, P. E. Coletta, W. B. Lewis, R. M. Paone, W. H. Russell, W. M. Belote; **Foreign Service Officer:** D. R. Perry; **Associate Professors:** E. H. Clark, Jr., J. T. Pole, H. H. Bell, Jr., C. L. Crane, Jr., H. A. Wycherley, J. P. Boatman, T. Boyajy, W. M. Darden, R. A. Bender, J. A. Arnold, R. A. Williams, A. A. Richmond, III, J. N. Wysong, J. W. Huston, R. Megargee, W. L. Calderhead, M. Jasperson, A. R. Whitaker, H. H. Hinrichs; **Lieutenant Commanders/Majors:** R. E. Goodspeed, T. E. Powers, C. Albans (USMC), R. B. McCall; **Assistant Professors:** J. P. Thomas, P. W. Warken, G. P. Atkins, C. L. Cochran, J. A. Fitzgerald, Jr., K. J. Kerin, P. R. Marshall, C. E. Morris, Jr., R. Broude, J. F. Collins, E. B. Duffee, Jr., J. T. French, P. A. Mangano, R. T. Bray, L. A. De Catur, L. R. Luis, J. J. McCusker, J. P. O'Sullivan, R. L. Rau, L. V. Thompson; **Lieutenants:** H. L. Harder, D. T. Coffee, W. S. Norman, B. R. Buchholz, J. A. Camp, T. G. Rhoad, A. R. Posner, D. T. Siebert, R. E. Ebbers, G. W. Reiger, E. P. Sullivan, J. C. Golembe, J. B. Wharton; **Lieutenants (j.g.)/1st Lieutenants:** B. G. Lattimore, Jr., K. A. Elmendorf (USMCR), D. C. Fuller, Jr., R. M. McCaffrey, G. R. Baker, R. M. Gibson, E. W. Gosnell, Jr., D. W. Buckley; **Ensign:** C. R. D'Amato; **Visiting Lecturer:** R. A. Mikaliunas.

Mission

The mission of the English, History, and Government Department is to educate the midshipman as a discriminating individual with an understanding of history, government, economics, and literature, and to develop in him a mature ability to read with comprehension and appreciation, to write with clarity and style, and to speak with conviction and poise. In support of this mission, the Department offers some 60 electives in addition to the 24 semester hours of core courses required of every midshipman.

Facilities

The English, History, and Government Department occupies Maury Hall adjacent to the Naval Academy Library. In addition to the usual recitation rooms, there are rooms with motion-picture, slide, microfilm, and tape-recording equipment to give midshipmen an opportunity to view events of historical and educational note and hear readings of great literature. There are also nearby auditoriums available for presentations to large groups.

CORE COURSES

H101	Composition and Literature (Survey of American Literature), *or*
H101a	Composition and Literature (Modern Literary Types), *or*
H103	Composition and Literature (Advanced Course)
H102	Composition and Literature (Survey of British Literature), *or*
H102a	Composition and Literature (Modern Literary Types), *or*
H104	Composition and Literature (Advanced Course)
H201	European Civilization and World Power Since the French Revolution
H303	United States Government and Constitutional Development
H304	Economic Analysis
H403	History of Seapower
H404	Readings in Western Ideas
H406	The United States in World Affairs

MINORS PROGRAM

Foreign Affairs

H639	International Relations and Organization
H642	U.S. Diplomatic History
H737	Modern Middle Eastern Problems, *or*
H735	Modern Far Eastern Problems, *or*
H831	Europe in the 20th Century
H746	Comparative Government and Politics, *or*
H732	Soviet History and Contemporary Problems, *or*
H738	Latin American History and Contemporary Problems
H938	Research Seminar in Area Studies
......	Any Foreign Affairs elective offered by this or Modern Languages Department, series 700 or above

Literature [1]

H721	The Western Literary Heritage I
H722	The Western Literary Heritage II
H821	The Western Literary Heritage III
H822	The Western Literary Heritage IV
H921	Seminar in Representative Contemporary Novelists, *or* any Modern Languages literature course, series 700 or above
H922	Seminar in Representative Playwrights, *or* any Modern Languages literature course, series 700 or above
H924	Seminar in Critical Evaluation of Literature, in lieu of H404

History

H611	West. Civilization to 1500, *or*
H631	U.S. History to 1865, *or*
H641	Introduction to Contemporary Non-Western Civilizations
H612	History of Europe, 1500–1815, *or*
H632	U.S. History Since 1865
H735	Modern Far Eastern Problems, *or*
H737	Modern Middle Eastern Problems, *or*
H731	History of Russia to 1917
H732	Soviet History and Contemporary Problems, *or*
H738	Latin American History and Contemporary Problems
H831	Europe in the 20th Century, *or*

Politics and Economics [2]

H741	Economics of Defense
H743	Political Theory
H744	Communism: Theory and Practice
H746	Comparative Government and Politics
H750	Political Parties and Group Politics
H751	Economic Statistics
H752	Econometrics
H755	Administration in Government
M770	Introduction to Mathematical Economics
H843	Constitutional Law
H848	Money and Banking
H942	Research Seminar in Politics and Economics

H944 Seminar in History
...... Any History elective, 700 series or above

...... Any Politics and Economics elective

MAJORS PROGRAM[3]

Foreign Affairs

H743 Political Theory, *or*
H641 Introduction to Contemporary Non-Western Civilizations
H638 Economic Geography
H831 Europe in the 20th Century, *or*
H745 Comparative Economic Systems, *or*
H739 Far Eastern Relations of the United States
H748 International Law, *or*
H744 Communism: Theory and Practice
H837 International Trade and Finance
...... Any Foreign Affairs elective offered by this or Modern Languages Department, 700 series or above

Literature

H621 Twentieth Century American Literature, *or*
H625 Introduction to Philosophy and Logic
H622 Twentieth Century British Literature
H623 Major British Writers, 14th–18th Centuries
H624 Major British Writers, 19th Century
H723 Shakespeare and His Contemporaries
H724 Classic American Writers

History

H611 Western Civilization to 1500, *or*
H631 U.S. History to 1865, *or*
H641 Introduction to Contemporary Non-Western Civilizations
H612 History of Europe, 1500–1815, *or*
H632 U.S. History Since 1865
H831 Europe in the 20th Century, *or*
H635 United States Economic History
H834 Modern European Revolutions, *or*
H835 American Colonial History, *or*
H642 United States Diplomatic History
H936 Seminar in the Philosophy of History
...... Any History elective, 700 series or above

Politics and Economics[2]

H635 U.S. Economic History
H638 Economic Geography
H743 Political Theory
H745 Comparative Economic Systems
H746 Comparative Government and Politics
H748 International Law
H750 Political Parties and Group Politics
H753 Price Determination and Decision-Making
M770 Introduction to Mathematical Economics
H845 Public Finance
H846 Economics of Labor Relations
H849 National Security Policy
...... Any Politics and Economics Elective

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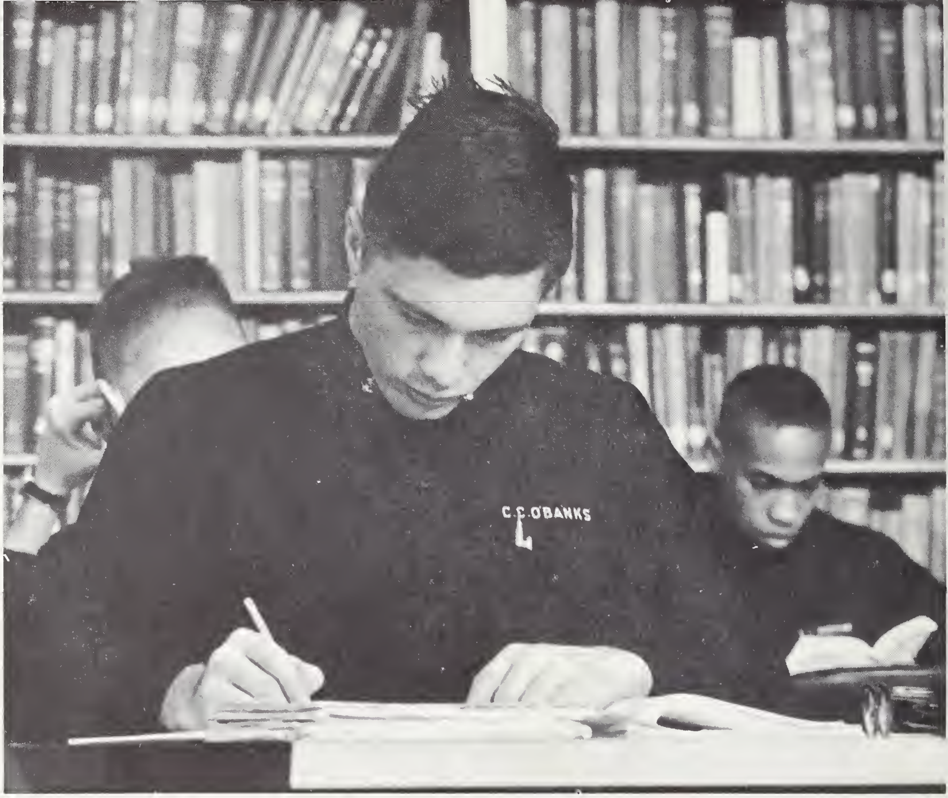
[1] *A midshipman minoring in Literature may, at his option, take the Literature major sequence of courses as his minor program, or, with the consent of his counselor, a combination of the two programs.*

[2] *In selecting the six elective courses required for a* minor *or the twelve courses required for a* major *in Politics and Economics, midshipmen will normally take a preponderance of courses in one field or the other. Concentrators in Economics are urged to take either H751, M770, or H752. Majors concentrating in Economics must take at least one of these courses. All Politics and Economics minors and majors are required to take H942.*

[3] *Courses listed under major are additional to those required under the minor.*



Course Descriptions

H101 COMPOSITION AND LITERATURE. *Three Sem Hrs (3–0).* Primary emphasis is on developing efficiency in reading and in oral and written communications. Reading and discussion of selections from major American writers. Weekly themes based on the readings and exemplifying basic forms of exposition; definition, classification, analysis, argument, criticism, comparison and contrast, etc. Individual conferences on composition. Practice in the use of dictionary, social and naval correspondence, and public speaking. Library visits, with an introduction to research techniques.

H101a COMPOSITION AND LITERATURE. *Three Sem Hrs (3–0).* The general objectives and procedures are the same as for H101, except that the emphasis in reading is on modern literary types (short story, novella, novel, essay, drama, poetry) instead of a survey of American literature. For selected midshipmen.

H102 COMPOSITION AND LITERATURE. *Three Sem Hrs (3–0).* A continuation and development of H101. Primary emphasis is on developing efficiency in reading and in oral and written communication. Reading and discussion of selections from British writers. Extensive practice in writing themes based on the readings and exemplifying basic forms of exposition. Individual conferences on composition in class. Library visits, with an introduction to research techniques.

H102a COMPOSITION AND LITERATURE. *Three Sem Hrs (3–0).* A continuation and development of H101a.

H103 COMPOSITION AND LITERATURE, ADVANCED COURSE. *Three Sem Hrs (3–0).* Designed for midshipmen with exceptional aptitude for composition and literature (approximately 10 percent). The general objectives are the same as those of H101, except that there is more emphasis on critical writing, and selected American authors are studied more intensively.

H104 COMPOSITION AND LITERATURE, ADVANCED COURSE. *Three Sem Hrs (3–0).* Designed for midshipmen with exceptional aptitude for composition and literature (approximately 10 percent). The major types of English literature are studied in complete works by outstanding men of letters. The general objectives are the same as those for H102, except that there is more emphasis on critical writing.

H201 EUROPEAN CIVILIZATION AND WORLD POWER SINCE THE FRENCH REVOLUTION. *Three Sem Hrs (3–0).* A study of European civilization during the period when the major European states experienced revolutionary transformation and exercised world-wide power. The growth of nationalism, the elements of national strength, the operation of the international balance of power, the impact of industrialization upon society and government, and the new scientific, intellectual, and cultural developments are studied. Special attention is given to the imperialistic expansion of European states throughout the world, to the origins and consequences of the two World Wars, to the Russian Revolution and Soviet development, and to the colonial revolutions in underdeveloped countries since World War II. A variety of readings is used, and a course paper on a specific problem is required.

H300 SPEECH. *One Sem Hr (1–0).* This course emphasizes speech composition and platform performance with the general objective of improving the midshipmen's general proficiency in oral expression. Attention is paid to *ex tempore* speaking, conference procedures, and presentations and briefings.

H303 UNITED STATES GOVERNMENT AND CONSTITUTIONAL DEVELOPMENT. *Three Sem Hrs (3–0).* Course objectives are (1) to implant in the midshipmen an understanding of the basic concepts of American democracy, (2) to establish an understanding of the Constitution and a knowledge of constitutional development, (3) to familiarize the student with the structure and functions of his government and the forces and factors which influence its operation, (4) to acquaint him with the nature and effects of administrative law, and (5) to compare his government with other types of government.

H304 ECONOMIC ANALYSIS. *Three Sem Hrs (3–0).* The elements of economics: national income, the theory of income determination, money, deposit-creation, public finance, business organization, prices and production, income-distribution, international trade, and economic growth.

H403 HISTORY OF SEAPOWER. *Three Sem Hrs (3–0).* The objective of this course is to provide the midshipmen with information basic to their profession, such as (1) the development of naval ships and weapons, (2) the evolution of naval tactics and amphibious doctrine, (3) the reasoning behind historic strategic decisions, (4) the influence of seapower upon history, and (5) the qualities of character and professional competence which have made great naval leaders. The nature and significance of seapower are studied in terms of their historical development successively in the Mediterranean, Atlantic, and Pacific regions. The major portion of the course is devoted to the evolution after 1900 of the surface, air, and undersea components, but the influence of changing technology on tactics and the relation of both to naval strategy provide the basic frame of analysis throughout the course. U.S. Naval leadership and operations are emphasized, and the course is concluded with a consideration of the problems of integrated American defense.

H404 READINGS IN WESTERN IDEAS. *Three Sem Hrs (3–0).* The objective of this course is to develop the midshipmen's intellectual maturity (1) by exploring some of the problems of human existence, (2) by deepening their understanding of human personality, (3) by sharpening their perceptions of literary values through writings and discussion, and (4) by perfecting their ability to communicate their own ideas and to evaluate those of others. There is no single standard textbook. Course work involves the reading and the discussing of at least five masterpieces selected from world literature, past and present. The readings and the discussions in any one class section are related to a single thematic objective. The instructor makes his own title selections for the class section; he then directs the classroom discussion toward the objective adopted. Examinations and formal essays emphasize advanced composition.

H406 THE UNITED STATES IN WORLD AFFAIRS. *Three Sem Hrs (3–0).* Covers the major problems and policies of the United States in its contemporary world relations. The historical development of American foreign policies and their current projection in international power politics are considered. American foreign policy is studied in terms of (1) its geographic, economic, political, and cultural determinants, (2) the decision-making process by which it is shaped, (3) its reciprocal relationship with national security policy in an age of nuclear technology, and (4) its implementation in the context of the interests and actions of the other world powers and of the geopolitical forces which underlie them.

H611 WESTERN CIVILIZATION TO 1500. *Three Sem Hrs (3–0).* A survey of the history of Western civilization during the ancient and medieval periods. Attention is given to political, economic, and social developments and to the cultural contributions of each people and period.

H612 HISTORY OF EUROPE, 1500–1815. *Three Sem Hrs (3–0).* A survey course in which the following major developments will be studied: the rise of Spain, England, and France as national states, the development of absolute monarchy, the era of oceanic exploration and of overseas colonization, the rise of capitalism, the Protestant Revolt or Reformation, the Scientific Revolution, the development of constitutional government, the rise of Russia and Prussia, and the French Revolution and Napoleon. Readings presenting differing points of view will be used as a basis of discussion.

H621 TWENTIETH CENTURY AMERICAN LITERATURE. *Three Sem Hrs (3–0)* Readings in drama, poetry, the essay, and the novel from 1900 to the present, with emphasis on such writers as Dreiser, Lewis, Hemingway, O'Neill, and Faulkner. *Prereq: H101, H102.*

H622 TWENTIETH CENTURY BRITISH LITERATURE. *Three Sem Hrs (3–0).* Readings from the major British writers of fiction and poetry since 1900. Especial attention to representative novels of Conrad, Lawrence, Joyce, Huxley, Waugh, Greene, and Cary. *Prereq: H101, H102.*

H623 MAJOR BRITISH WRITERS, 14th–18th CENTURIES. *Three Sem Hrs (3–0).* Intensive study of selected works of principal figures in the literature of England such as Chaucer, Malory, Spenser, Donne, Milton, Pope, and Fielding; their thought and art, their historical background, their significance as representatives of their times, and their contributions to the culture of the English-speaking nations. *Prereq: H101, H102.*

H624 MAJOR BRITISH WRITERS, 19th CENTURY. *Three Sem Hrs (3–0).* Intensive study of selected works of principal figures in the literature of England in the 19th century such as Wordsworth, Keats, Scott, Dickens, Tennyson, Browning, Arnold, and Hardy; their thought and art, their historical background, their significance as representatives of their times, and their contributions to the culture of the English-speaking nations. *Prereq: H101, H102.*

H625 INTRODUCTION TO PHILOSOPHY AND LOGIC. *Three Sem Hrs (3–0).* A survey of Western secular philosophy based on readings in representative philosophers. The main objective is to acquaint the student with the basic problems of philosophical inquiry and a variety of solutions to them. The principles of logic are introduced at appropriate points.

H631 UNITED STATES HISTORY TO 1865. *Three Sem Hrs (3–0).* A historical study of the development of American civilization from 1763 through the Civil War. Attention is paid to the historical foundations of the Nation and its culture, including the American Revolution, the growth of nationalism, the westward movement, and the sectional crisis. Emphasis is placed upon the development of the major institutions of the United States having their origins within their period.

H632 UNITED STATES HISTORY SINCE 1865. *Three Sem Hrs (3–0).* A continuation of the study of American civilization from the Reconstruction Period to the present, emphasizing the course of industrialization, the settlement of the West, and the emergence of the United States as a world power. Attention is paid to the development of our present society through the impact of the two World Wars and the Great Depression.

H635 UNITED STATES ECONOMIC HISTORY. *Three Sem Hrs (3–0).* A study of the American economy from Colonial times to the present, with special emphasis on the interrelations between the ways Americans have made a living and their social and political attitudes, America's role in the world economy, the rise of the large corporation, and the development of the labor movement.

H638 ECONOMIC GEOGRAPHY. *Three Sem Hrs (3–0).* The study of earth science insofar as its affects man's patterns of production, distribution, and consumption: population, climatology, soil characteristics, and distribution of mineral resources.

H639 INTERNATIONAL RELATIONS AND ORGANIZATION. *Three Sem Hrs (3–0).* Deals with the principles, theories, machineries, and major problems of international relations. It stresses the development of international organizations, particularly the United Nations and regional organizations, and their roles in international affairs. Extensive opportunity is provided for the study of policy and the application of diplomatic strategy to major international problems.

H641 INTRODUCTION TO CONTEMPORARY NON-WESTERN CIVILIZATIONS. *Three Sem Hrs (3–0).* Designed to provide the midshipman with a basic knowledge of the civilizations of Asia and Africa. Emphasis is placed upon the understanding of cultural patterns and ways of life and thought in the areas concerned. Subject matter includes treatment of religion and philosophy, social structure, economic conditions, political forms and attitudes, and the role of the area in world affairs.

H642 UNITED STATES DIPLOMATIC HISTORY. *Three Sem Hrs (3–0).* This course is designed to give a thorough knowledge of the historical development of basic United States foreign policies from the American Revolution to the present. It stresses the fundamental principles and forces which have shaped these policies and the evolving role of the United States.

H721, H722, H821, H822 THE WESTERN LITERARY HERITAGE, I, II, III, IV. The basis of the Literature minor is a four-semester sequence called The Western Literary Heritage, which comprises a study of the most significant and characteristic literary productions of Western civilization from ancient times to the present. There are four divisions of the course (corresponding to the four semesters of Third and Second Class years) with the subtitles:

H721	I, Classical Literature
H722	II, Medieval and Renaissance Literature
H821	III, Continental Literature, 17th–19th Centuries
H822	IV, Continental Novels, 19th–20th Centuries

H721 THE WESTERN LITERARY HERITAGE I: Classical Literature. *Three Sem Hrs (3–0).*

Greece.
Greek mythology. Homeric Epic: *Iliad*. Hellenic humanism: the tragedies of Aeschylus, Sophocles, Euripides. Satiric comedy: Aristophanes.

Rome.
Roman Epic: Vergil, *Aeneid*. Roman comedy: Plautus and Terence. Caesar, *Commentaries*. Roman poetry: Catullus, Martial, Horace, Ovid.

Prereq: H101, H102.

H722 THE WESTERN LITERARY HERITAGE II: Medieval and Renaissance Literature. *Three Sem Hrs (3–0).*

Medieval Europe.
Medieval Epic: *The Nibelungenlied*. Romance Literature: *The Song of Roland; The Cid; Aucassin and Nicolette; The Romance of the Rose;* François Villon. Marco Polo, *Travels*. Dante, *The Divine Comedy.*
Medieval drama. Goliardic verse.

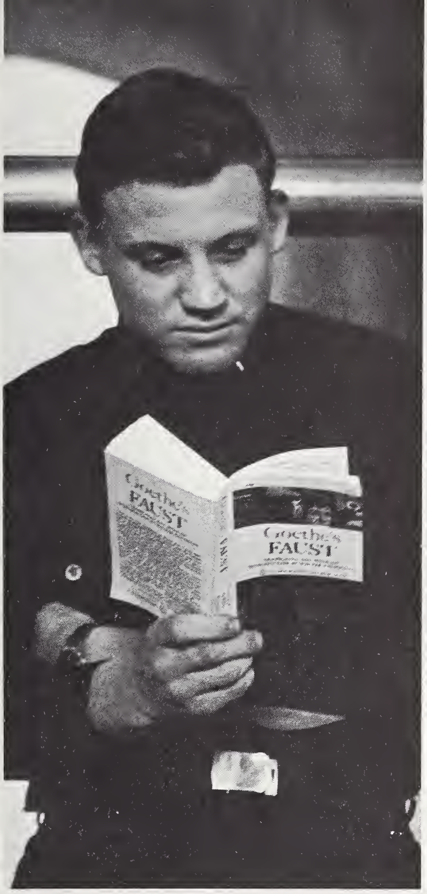
The Renaissance.
Petrarch, *Sonnets*. Boccacio, *Decameron*. Castiglione, *The Courtier*. Machiavelli, *The Prince*. Erasmus, *The Praise of Folly*. Rabelais, *Gargantua and Pantagruel*. Montaigne, *Essays*. Cellini, *Autobiography*.

Prereq: H101, H102.

H723 SHAKESPEARE AND HIS CONTEMPORARIES. *Three Sem Hrs (3–0).* Intensive study of the major dramatic works of Shakespeare against the background of Tudor and Stuart life and literature, especially the plays of Shakespeare's fellow dramatists of the English Renaissance. Special consideration of Shakespeare's thought, dramatic development, and literary stature, particularly as revealed by comparison of his plays with the dramatic works of his contemporaries. *Prereq: H101, H102.*

H724 CLASSIC AMERICAN WRITERS. *Three Sem Hrs (3–0).* Readings in the works of the major American literary figures of the 19th century: Poe, Emerson, Thoreau, Hawthorne, Whitman, Melville, Clemens, and Henry James; their literary careers, the sources (particularly the native sources) of their ideas and art, their significance as representatives of their times, and their contributions to American civilization. *Prereq: For 1/C and 2/C only.*

H731 HISTORY OF RUSSIA TO 1917. *Three Sem Hrs (3–0).* An introduction to the political, cultural, and social history of Russia from the founding of the Moscow Principality through its expansion down to 1914. The growth of national consciousness, drive, and objectives are emphasized, together with the factors fostering the anomalous survival of the principle of autocracy from the 13th-century Mongol invasion. *Prereq: H201.*



H732 SOVIET HISTORY AND CONTEMPORARY PROBLEMS. *Three Sem Hrs (3–0).* An examination into the development of the Soviet Union, detailing the overthrow of the Provisional Government, the Civil War, and the consolidation of power under Lenin, Stalin, and Khrushchev. Particular emphasis is placed on the various policies adopted by the Soviet regime in meeting its foreign and domestic problems, including economic, political, and social developments within the Union, in the Orient, and in Europe. *Prereq: H201.*

H734 MODERN AFRICAN PROBLEMS. *Three Sem Hrs (3–0).* This course is designed to provide an understanding of contemporary African problems and tensions and their international ramifications. It offers an introduction to African cultures and social institutions, then proceeds to a consideration of the impact of Western culture and technology and the consequent European political and economic domination, and concludes with an examination of current African reactions to this recent past and their implications for the West.

H735 MODERN FAR EASTERN PROBLEMS. *Three Sem Hrs (3–0).* This course is designed to provide an understanding of the recent history and contemporary problems of the Far East. It presents a brief introduction to traditional Oriental culture and institutions, proceeds to discuss the impact of Western culture, technology, and political systems in the 19th century, and concludes with an examination of the problems accompanying the emergence of Asian nationalism in the 20th century. *Prereq: H201.*

H737 MODERN MIDDLE EASTERN PROBLEMS. *Three Sem Hrs (3–0).* This course is designed to provide an understanding of the current international tensions and problems centered in the Middle Eastern area. A thorough grounding is given in the essential elements of Middle Eastern history, culture, and sociology, and the problems of internal and international political tensions in the area are studied in detail. Special emphasis is placed upon problems of naval and diplomatic importance, including Middle East oil and the penetration of Soviet influence into the area. *Prereq: H201.*

H738 LATIN AMERICAN HISTORY AND CONTEMPORARY PROBLEMS. *Three Sem Hrs (3–0).* A survey designed to provide reasonable familiarity with the origins and growth of our southern neighbors. The complex threads of the struggle for independence, fragmentation by nationalism, and the rise of national leaders are subordinated in emphasis to the development of the forces shaping Pan-Americanism. The significance for Latin America, the United States, and the world of the ideal of "La Patria Grande" is explored. A reading knowledge of Spanish or Portuguese is desired though not required. *Prereq: H201.*

H739 THE FAR EASTERN RELATIONS OF THE UNITED STATES, *Three Sem Hrs (3–0).* A consideration of the development of the diplomatic, cultural, and economic relations of the United States and the Far East. Special emphasis is placed on developments since 1850, particularly upon the interaction of the foreign policies of the United States with those of the major Far Eastern Powers as the latter were stimulated by imperialism, nationalism, industrialism, democracy, and communism. *Prereq: H201.*

H743 POLITICAL THEORY. *Three Sem Hrs (3–0).* A study of political philosophy, with emphasis on the roots of democracy; the writings of Plato, Aristotle, St. Thomas Aquinas, Machiavelli, Hobbes, Locke, Montesquieu, Rousseau, Burke, Hegel, Marx, the Fabians, John Dewey; the great documents—*Magna Carta,* the *Declaration of Independence*—and American theory of the Revolution. A major theme is the philosophic background for the present confrontation of individualistic democracy and Communist totalitarianism. *Prereq: H201.*

H744 COMMUNISM: THEORY AND PRACTICE. *Three Sem Hrs (3–0).* A study of the philosophy of communism from the writings of Engels, Marx, Lenin, and Stalin; history of the Internationals; the role of the Comintern and the "international party," relations of the Soviet Union with radical parties outside Russia and with European Social Democratic parties; policies in the satellite nations; and security problems in the Western democracies. *Prereq: H303.*

H745 COMPARATIVE ECONOMIC SYSTEMS. *Three Sem Hrs (3–0).* A study of the various possible methods of economic organization—in theory and in practice. An assessment in detail of the different solutions to the problems of production, distribution, and growth under free enterprise, mixed capitalism, and detailed economic planning. *Prereq: H304.*

H746 COMPARATIVE GOVERNMENT AND POLITICS. *Three Sem Hrs (3–0).* In addition to the conventional focus on the structure and operation of the principal foreign governments, the course will survey structural and functional analysis, communication theory, theories of power structure, theories of political parties, conflict theory, political socialization, ideology, and voting behavior. Political systems to be studied include those of the United Kingdom, France, West Germany, the Soviet Union, Communist China, and Japan. *Prereq: H303.*

H748 INTERNATIONAL LAW. *Three Sem Hrs (3–0).* A survey of the public law of nations including the law of peace and the law of war. The history and theory of international law are studied; problems and cases are used to make the sub-

ject live and current. Attention is given to the role of international law in international relations. *Prereq: H303.*

H749 COMMUNIST CHINA. *Three Sem Hrs (3–0).* An examination of the background and development of the Communist People's Republic of China to include the Chinese Communist Revolution and Civil War (1927–49). Further analysis deals with the economic, political, and foreign policies used by the Chinese Communists from 1949 up to the present. This analysis is integrated and evaluated with the original contributions of Mao Tse-tung to Communist theory to indicate the ideological content of Chinese Communist actions. Particular emphasis in this latter phase is directed to an analysis of Mao's strategic concept of revolutionary wars of national liberation and the utilization of guerrilla warfare by the emerging nations of Asia and Africa.

H750 POLITICAL PARTIES AAND GROUP POLITICS. *Three Sem Hrs (3–0).* A study of the dynamics of group politics in the American system of government. The course demonstrates that political parties and interest groups have developed outside of the original constitutional framework to channel political power in the community, and it emphasizes the roles played by parties, interest groups, public opinion, and elections in the American political process. The course is empirically oriented. *Prereq: H303.*

H751 ECONOMIC STATISTICS. *Three Sem Hrs (3–0).* Introduction to summarization techniques most commonly encountered in business, finance, and economic analysis: computation and interpretation of measures of central tendency, dispersion, and skewness; graphic and tabular presentation of univariate and bivariate distribution; special attention to theory and practice of index numbers and to parametric and non-parametric descriptions of economic time series. *Prereq: H304.*

H752 ECONOMETRICS. *Three Sem Hrs (3–0).* Quantification of basic economic theory: rational criteria for the selection of economic models underlying various mathematical forms extended to describe working economies; multiple regression and correlation techniques for the construction and testing of econometric models; and study of selected alternative models of particular current economic interest. *Prereq: H304.*

H753 PRICE DETERMINATION AND DECISION-MAKING. *Three Sem Hrs (3–0).* Intermediate level microeconomics: the theory of market price, factor-pricing, the dynamics of supply and demand, the regulation of competition and monopoly, indifference curves, welfare economics, and theory of valuation, plus some applications of economic reasoning to problems of choice in decision-making in business and in defense planning. *Prereq: H304.*

H755 ADMINISTRATION IN GOVERNMENT. *Three Sem Hrs (3–0).* A critical analysis, on an advanced level, of the federal administrative organization as an integral part of the political system. The roles of the Presidency, Congress, the Judiciary, independent regulatory commissions, interest groups, political parties, and the public in the administrative process are stressed. Special attention is given to the forces and factors which comprise the environment of federal administration and affect policy-making and implementation. The course is empirically oriented. *Prereq: H303.*

H821 THE WESTERN LITERARY HERITAGE III: Continental Literature, 17th–19th Centuries. *Three Sem Hrs (3–0).* Cervantes, *Don Quixote*, Moliere, *Comedies*. Rousseau, *Confessions*. Voltaire, *Candide*. Goethe, *Faust*. *Prereq: H101, H102.*

H822 THE WESTERN LITERARY HERITAGE IV: Continental Novels, 19th–20th Centuries. *Three Sem Hrs (3–0).*

The French Novel.
Balzac, *Old Goriot;* Zola, *Germinal;* Proust, *Remembrance of Things Past.*

The Russian Novel.
Dostoevski, *Crime and Punishment;* Tolstoi, *War and Peace;* Turgenev, *Fathers and Sons.*

The German Novel.
Mann, *The Magic Mountain.*

Prereq: H101, H102.

H831 EUROPE IN THE TWENTIETH CENTURY. *Three Sem Hrs (3–0).* An examination of the developments which gave European nations their predominant importance in the first part of the 20th century and of the impact of two world wars, the great depression, and the cold war upon the domestic status of these nations and their positions in contemporary world affairs. *Prereq: H201.*

H834 MODERN EUROPEAN REVOLUTIONS. *Three Sem Hrs (3–0).* A study of the origins, nature, and historical significance of the three great European revolutions of modern times which occurred in 17th-century England, 18th-century France, and 20th-century Russia. *Prereq: H201.*

H835 AMERICAN COLONIAL HISTORY. *Three Sem Hrs (3–0).* This course deals with the origins of American civilization from the Age of Discovery to 1763. Emphasis is placed upon the founding of the colonies and their development in the 17th and 18th centuries. Study is made of the American origins of such institutions as slavery, representative government, religion, law, and the military. *Prereq: H631.*

H837 INTERNATIONAL TRADE AND FINANCE. *Three Sem Hrs (3–0).* An introduction to the principles, practices, and institutions of international finance and trade. Included in the scope of the course are balance of payments, trade policies and agreements, financial and trade practices, and international agencies and their functioning in the area of finance and trade. *Prereq: H304.*

From Vienna
SECOND EDITION
STATICS and DYNAMICS
VECTOR EDITION

H838 ECONOMIC DEVELOPMENT. *Three Sem Hrs (3–0).* The study of theories of economic development as applied to contemporary problems in the field, with emphasis on population factors, geographic environment, and institutions as determinants of the rate of growth. The course includes consideration of foreign trade relationships, banking arrangements, and supply of domestic and foreign capital. Some attention is given to problems of administering an AID program. *Prereq: H304.*

H839 UNITED STATES MILITARY HISTORY AND POLICY. *Three Sem Hrs (3–0).* A survey of U.S. military history and policy from Colonial times to the present. It provides extensive opportunity to analyze major land and sea campaigns, problems of logistics, the implementation of national policy by the military forces, the relationship between the U.S. military staffs and the civil government, the effect of airpower on strategy, and concepts of nuclear warfare. *Prereq: H932; or 1/C, with permission of instructor.*

H840 ELEMENTS OF LAW. *Three Sem Hrs (3–0).* The essentials of the law of crimes, contracts, torts, agency, real and personal property, domestic relations, testaments, negotiable instruments, and taxation, with a view of familiarizing the student with those branches of the law he is most likely to encounter in his role as a citizen and as an officer of the Armed Forces. *Prereq: H303.*

H841 THE ECONOMICS OF DEFENSE. *Three Sem Hrs (3–0).* Intermediate-level economic analysis, with emphasis on policy problems in war and cold war production and manpower programming, allocation of materials, stockpiling, wage and price controls, rationing, wartime fiscal and monetary policies; and economic reasoning in Defense Department decision-making. *Prereq: H304.*

H843 CONSTITUTIONAL LAW. *Three Sem Hrs (3–0).* A survey of the basic principles of American constitutionalism. Included in this course are the history of American constitutional development; implementation of separation of powers, federalism, and limited government; development and exercise of national powers; judicial function in constitutional cases; and introduction to civil rights and liberties. *Prereq: H303.*

H845 PUBLIC FINANCE. *Three Sem Hrs (3–0).* The study of all aspects of governmental financial activities and institutions, with emphasis on fiscal and monetary policy. Topics of study include the budget-making process, the role of the Council of Economic Advisers, the function of the Federal Reserve System, and tax policy at all levels of government. Emphasis is on U.S. institutions and practices. *Prereq: H304.*

H846 ECONOMICS OF LABOR RELATIONS. *Three Sem Hrs (3–0).* Designed to give the midshipman a general survey of the field of labor relations. A study is made of labor history in the United States, the organization of unions, the economics of the labor market, and the relationship between government and labor. Special attention is given to labor-management relations and current labor problems. *Prereq: H304.*

H848 MONEY AND BANKING. *Three Sem Hrs (3–0).* A systematic study of monetary standards, credit instruments, check clearance, deposit creation, interest rates, currencies, exchange notes, credit policies, and the role of central banks. *Prereq: H304.*

H849 NATIONAL SECURITY POLICY. *Three Sem Hrs (3–0).* A study of the theory and application of strategy and policy formulation and of the interrelationship of foreign and military policies in U.S. national security. It stresses the roles of the intelligence function, diplomatic goals, economic and military capabilities, and of government institutions and agencies in the creation of national policy and strategy. *Prereq: 1/C only, or permission of instructor.*

H921 SEMINAR IN REPRESENTATIVE CONTEMPORARY NOVELISTS. *Three Sem Hrs (3–0).* Intensive study of selected works of modern novelists such as Moravia, Camus, Silone, Faulkner, Greene, and Malraux as representatives of contemporary points of view on political, social, and ethical problems of the 20th century. Discussions, collateral readings, reports, and individual reading projects. *Prereq: 1/C only, or permission of instructor.*

H922 SEMINAR IN REPRESENTATIVE PLAYWRIGHTS. *Three Sem Hrs (3–0).* Intensive study of modern drama, American, British, and Continental, as representative of contemporary points of view on the political, social, and ethical problems of the 20th century. Discussions, collateral readings, reports, and individual reading projects. *Prereq: 1/C only; or permission of instructor.*

H924 SEMINAR IN CRITICAL EVALUATION OF LITERATURE. *Three Sem Hrs (3–0).* Varieties of modern literary criticism; the approaches and uses of critical analysis and evaluation. The major endeavor in the course will be the writing of a substantial critical essay in which the aims and ideals of modern literary criticism are exemplified and the humanistic values of literature are stressed. *Prereq: 1/C only, or permission of instructor.*

H932 SEMINAR IN THE PHILOSOPHY OF WAR. *Three Sem Hrs (3–0).* A survey of the ethical and operational problems in war. It provides for the study of the causes and nature of war, an examination of limited and absolute war, the relationship between military staffs and civil governments, and an analysis of the writings of the leading men on the subject. *Prereq: 2/C only, or permission of instructor.*

H933 SEMINAR IN RUSSIAN MILITARY AND NAVAL DOCTRINE. *Three Sem Hrs (3–0).* The evolution of Russian strategic and tactical concepts, the interrelationship of armed services, the development of materiel, education and training, and illustrative campaigns. Emphasis is placed upon outstanding Russian formulators and practitioners of military and naval doctrine. The influence of Stalin upon Soviet military doctrine and its differences from conventional concepts are emphasized. A reading knowledge of the Russian language is desirable but not required. *Prereq: 1/C only, or permission of instructor.*

H936 SEMINAR IN THE PHILOSOPHY OF HISTORY. *Three Sem Hrs (3–0).* An analysis of the major schools of historical interpretation from the Hellenic era to Existentialism. Particular attention is paid to the philosophical and cosmological foundations of historical interpretation, the problems of causality, and the materialist-supernaturalist controversy. Readings and discussions. *Prereq: 1/C only, or permission of instructor.*

H938 RESEARCH SEMINAR IN AREA STUDIES. *Three Sem Hrs (3–0).* A detailed analysis of the historic background and current developments of a particular region of the world with reference, wherever appropriate, to the objectives of U.S. foreign policy. Much time is devoted to discussion and examination of basic source materials and to a research paper in the chosen area of study. The areas examined include Africa, Europe, the Far East, Latin America, and the Middle East. *Prereq: 1/C only, or permission of instructor.*

H942 RESEARCH SEMINAR IN POLITICS AND ECONOMICS. *Three Sem Hrs (3–0).* A seminar in methodology and types of research materials in either politics or economics, with each student pursuing his particular interest in a research paper. *Prereq: 1/C only, or permission of instructor.*

H944 SEMINAR IN HISTORY. *Three Sem Hrs (3–0).* After study of research methodology in the field of history, this seminar will meet in three different sections so that each midshipman may pursue his special interest in United States, European, or Naval history. In each section, major historical problems, institutions, and developments will be given intensive study through readings, reports, and discussions. Each midshipman will develop a research project and write a seminar paper. *Prereq: 1/C only, or permission of instructor.*

AFTER-DINNER SPEAKING. Throughout First Class Year, small dinners are given under the auspices of the English, History, and Government Department, with the primary objective of providing a setting for midshipman after-dinner speaking under realistic circumstances. Outside guests of honor and faculty members are present. Each member of the First Class participates in at least two of these dinners.

Mathematics Department

Head of Department: Captain J. W. Johnston; **Executive Officer:** Commander A. B. Snively III; Senior **Professor:** L. H. Chambers; **Professors:** E. Hawkins, A. E. Currier, R. P. Bailey, T. J. Benac, J. C. Abbott, E. E. Betz, S. S. Saslaw, C. P. Brady, V. N. Robinson, J. M. Holme, J. F. Paydon, R. C. Morrow, K. L. Palmquist, H. K. Sohl, W. H. Sears, Jr., J. Milkman, G. R. Strohl, Jr., J. A. Tierney, M. L. Kales; **Commanders:** W. F. Kelly, L. P. Cuccias, G. G. DeBroder; **Associate Professors:** J. F. Milos, H. L. Kinsolving, O. M. Thomas, M. V. Gibbons, E. C. Gras, W. J. Strange, B. H. Buikstra, J. R. Gorman, N. O. Niles, M. F. Stilwell, H. Wierenga, E. G. Swafford, C. E. Thompson, J. H. White, R. Molloy, A. A. Karwath, C. S. Wolfe, J. W. Jayne, H. M. Kaplan; **Lieutenant Commanders:** H. F. Rempt, Jr., J. J. Dittrick, W. A. Arata III; **Assistant Professors:** G. E. Culbertson, G. E. Haborak, W. J. Hildebrand, G. E. Schillinger, J. P. Edwards, Jr., D. C. Mayne, C. E. Moore, L. B. Palmer, R. A. O'Brien, Jr., D. J. Palmer, H. B. Coonce, L E. Ewing, J. W. Davison, Jr., F. I. Davis, M. B. Rosenzweig, S. R. Bernfeld, A. B. Calica, G. R. Giellis, R. A. Herrmann; **Lieutenants:** D. Fecko, M. H. Merrill, R. W. Atcheson, D. G. Svendsgaard, R. D. Newmister, C. L. Robertson, Jr., J. G. Whelan, W. B. Barton, R. N. Leggett, Jr., R. F. Maruszewski, C. S. Davis, D. R. Gregory, R. A. Ilka; **Lieutenants (j.g.):** L. J. Fransen, R. E. O'Brien; **Ensigns:** G. G. Galloway, D. A. Gerstner.

Mission

The mission of the Mathematics Department is threefold, namely, (1) to teach mathematics as a basic science, (2) to provide midshipmen with a knowledge of fundamental mathematical concepts, and (3) to develop a facility for the use of mathematics in solving practical problems arising in other departments. The basic and elective courses are planned in such a manner as to be of the greatest possible assistance to the midshipmen in their work throughout the professional departments. Development of an analytic approach to problems and an understanding of basic principles involved is stressed throughout the courses taught. In addition to the required core courses, there are 24 elective courses offered.

M K JONES

CORE COURSES

Basic Curriculum

(None) Plane Trigonometry[1]
M111 Calculus I
M120 Calculus II
M215 Calculus III
M224 Analysis IV[2]
M309 Analysis V

[1] For those midshipmen not offering Trigonometry upon entrance.

[2] Variations may be made in the curricula of midshipmen completing Matrix Theory (M601).

Half-Term Validation Curriculum[1]

M151 Calculus I–B
M152 Calculus II–B
M221 Calculus III–B
M228 Analysis IV–B[2]
M309 Analysis V

[1] For midshipmen who have successfully completed a course in analytic geometry prior to entrance.

[2] Variations may be made in the curricula of midshipmen completing Matrix Theory (M601).

Optional Course Sequence I[1]

M111 Calculus I
M150 Matrix Theory and Computer Programming
M120 Calculus II
M217 Calculus and Differential Equations
M218 Differential Equations, Probability and Statistics

[1] Open to a selected group of midshipmen.

Optional Course Sequence II[1]

M151 Calculus I–B
M150 Matrix Theory and Computer Programming
M152 Calculus II–B
M220 Differential Equations
M311 Analysis V–B

[1] Open to a selected group of midshipmen.

Optional Course III[1]

M109 Introductory Analysis
M110 Calculus I–C
M213 Calculus II–C
M221 Calculus III–B
M309 Analysis V

[1] Open to a selected group of midshipmen.

MINORS PROGRAM

Mathematics

M601 Matrix Theory

One course from:
M602 Modern Algebra
M604 Numerical Analysis
M606 Probability and Statistics II
M671 Linear Programing

One course from:
M721 Advanced Calculus I
M751 Engineering Mathematics I

One course from:
M722 Advanced Calculus II
M752 Engineering Mathematics II

Two courses from:[1]
Mathematics, Science, Weapons, Naval Science, or Engineering

[1] Selection of courses must be approved by Head of Math Department.

MAJORS PROGRAM

Theoretical Mathematics

M601 Matrix Theory
M602 Modern Algebra
M721 Advanced Calculus I
M722 Advanced Calculus II

Four courses from:
M802 Introduction to Complex Variable
M861 Linear Algebra
M862 Advanced Differential Equations I
M863 Advanced Differential Equations II
M864 Topology
M866 Algebraic Structures

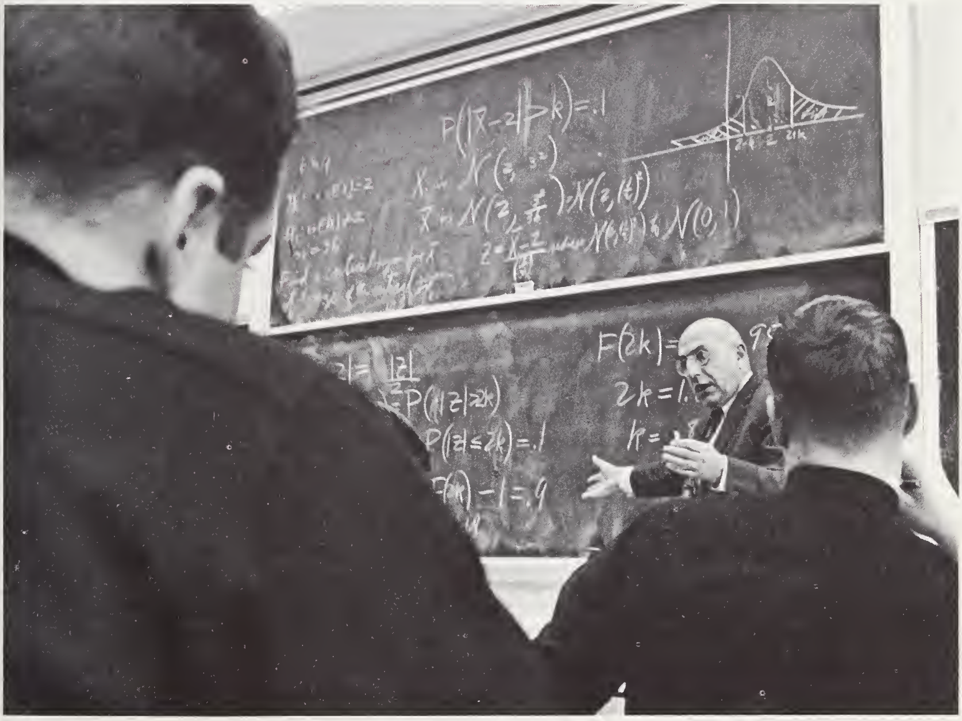
Applied Mathematics

M601 Matrix Theory

One course from:
M602 Modern Algebra
M604 Numerical Analysis
M606 Probability and Statistics II
M671 Linear Programing

Plus:
M721 Advanced Calculus I
M751 Engineering Mathematics I
M825 Methods of Applied Mathematics I
M826 Methods of Applied Mathematics II

Two courses from:
M802 Introduction to Complex Variable
M852 Operational Methods
M861 Linear Algebra
M862 Advanced Differential Equations I
M863 Advanced Differential Equations II
M864 Topology



Mathematics

Course Descriptions

PLANE TRIGONOMETRY. Trigonometric functions; graphs: equations; slide rule solutions of triangles. For those midshipmen not offering trigonometry upon entrance. No credit granted.

M109 INTRODUCTORY ANALYSIS. *Four Sem Hrs (4–0). Algebra:* Sets and implications; proofs; the number system; polynomials; binomial theorem; fractions; exponents; linear, guadratic, and simultaneous equations; inequalities; functions and relations. *Calculus:* Graphs; line; preview of calculus; limits; continuity; differentiation; the chain rule; applications; differentials; related rates.

M110 CALCULUS I–C. *Four Sem Hrs (4–0).* The definite integral; conic sections; translation of axes; trigonometric and exponential functions; parametric equations; arc length; curvature; polar cordinates; vectors in a plane; methods of integration. *Prereq: M109.*

M111 CALCULUS I. *Four Sem Hrs (4–0).* Functions of one variable; differentiation and integration; selected topics in analytic geometry; applications.

M120 CALCLULUS II. *Four Sem Hrs (4–0).* Logarithmic and exponential functions; function of several variables; multiple integrals; selected topics in analytic geometry; applications. *Prereq: M111.*

M150 MATRIX THEORY AND COMPUTER PROGRAMMING. *Three Sem Hrs (3–0). Matrix Theory:* Matrix alegbra; linear systems; determinants; vector spaces; characteristic values. *Computer Programming:* Introduction; constants, variables and arithmetic statements; control statements; loops; input/output statements; subprograms.

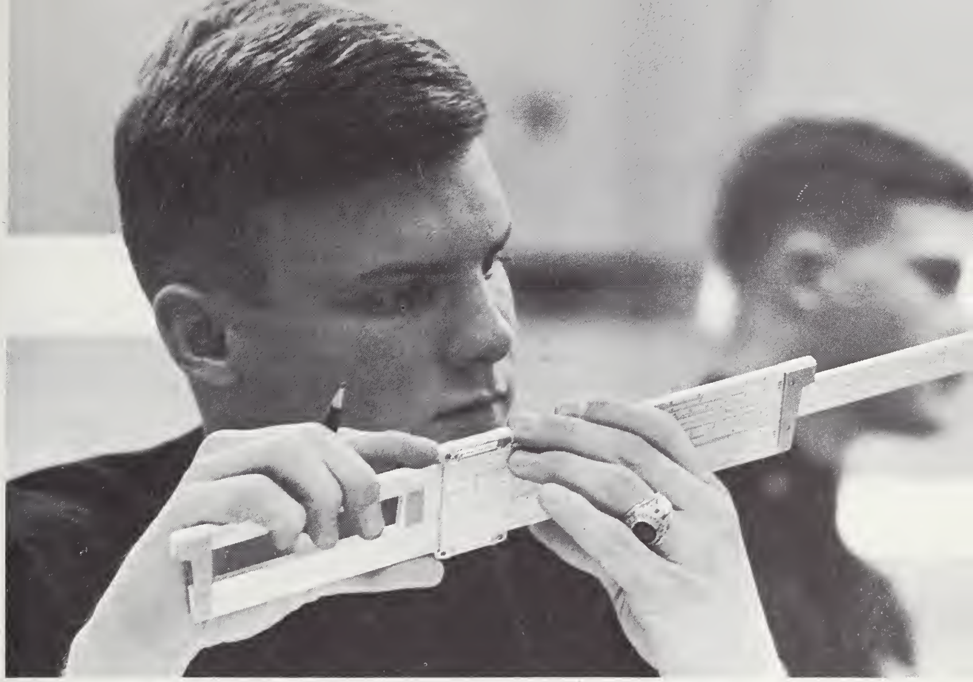
M151 CALCULUS I–B. *Four Sem Hrs (4–0).* Applications of differentiation; the definite integral; topics in analytic geometry; trigonometric and exponential function; vectors in a plane. For midshipmen validating one-half term of mathematics.

M152 CALCULUS II–B. *Four Sem Hrs. (4–0).* Formal integration with applications; solid analytic geometry; vectors in three dimensions; series; partial differentiation; multiple integration. *Prereq: M151.*

M213 CALCULUS II–C. *Four Sem Hrs (4–0). Calculus:* Volumes of revolution; improper integrals; trapezoidal rule; analytic geometry of three dimensions; vectors in three dimensions; series; partial differentiation; multiple integration. *Linear Algebra:* Matrix algebra; linear systems and elementary operations; determinants. *Prereq: M110.*

M215 CALCULUS III. *Four Sem Hrs (4–0).* A composite course covering the following topics in calculus, differential equations, and computer programming: *Calculus*—Infinite series; partial differentiation and multiple integration; *Differential Equations*—Introduction to differential equations; first and higher order differential equations with constant coefficients; *Computer Programming*—Introduction to computer programming; constants; variables; arithmetic statements; control statements; loops, input/output statements and subprograms. *Prereq: M120.*

M217 CALCULUS AND DIFFERENTIAL EQUATIONS. *Four Sem Hrs (4–0). Calculus:* Partial differential equations; infinite series. *Differential Equations:* Introduction; first and higher order equations; applications; linear equations with constant coefficients; Laplace transforms and applications. *Prereq: M120 and M150.*



M218 DIFFERENTIAL EQUATIONS, PROBABILITY AND STATISTICS. *Four Sem Hrs (4–0). Differential Equations:* Applications of linear differential equations with constant coefficients; series and numerical solution of differential equations; partial differential equations. *Probability and Statistics:* Sets; probability; random variables; expected values and moments, probability distributions, a central limit theorem, estimation, testing hypotheses, statistical decision theory. *Prereq: M217.*

M220 DIFFERENTIAL EQUATIONS. *Four Sem Hrs (4–0).* Linear differential equations; Laplace transform; simultaneous differential equations: series solution of differential equations; partial differential equations; Fourier series; applications. *Prereq: M150 and M152.*

M221 CALCULUS III–B. *Four Sem Hrs (4–0).* A composite course covering the following topics in differential equations and computer programming: *Differential Equations*—Introduction to differential equations; first and higher order differential equations; applications of differential equations; linear differential equations with constant coefficients; Laplace transforms; applications of linear differential equations with constant coefficients; series and numerical solutions of differential equations and partial differential equations; *Computer Programming*—Introduction to computer programming; constants; variables; arithmetic statements; control statements; loops; input/output statements and subprograms. *Prereq: M152 or M213.*

M224 ANALYSIS IV. *Four Sem Hrs (4–0).* A composite course covering the following topics in differential equations and linear algebra: *Differential Equations*—Laplace transforms, application of linear differential equations with constant coefficients; simultaneous equations; series and numerical solutions; partial differential equations; *Linear Algebra*—Matrix Algebra; linear systems; determinants; vector spaces; characteristic values. *Prereq: M215.*

M226 ANALYSIS IV–A. *Three Sem Hrs (3–0).* For those midshipmen who are taking or have had Matrix Theory (M601). *Differential Equations*—Laplace transforms; applications of linear differential equations with constant coefficients; simultaneous equations; series solutions; numerical solutions; partial differential equations; separation of variables; boundary problems; Fourier series. *Prereq: M215.*

M228 ANALYSIS IV–B. *Four Sem Hrs (4–0).* A composite course covering differential equations, linear algebra, and linear programming as follows: *Differential Equations*—Partial differential equations; separation of variables; boundary value problems; Fourier series; *Linear Algebra*—Matrix algebra; linear systems; determinants; vector spaces; characteristic values; *Linear Programming*—Linear inequalities; min-max problem; transportation problem; simplex method; game theory. *Prereq: M221.*

M309 ANALYSIS V. *Three Sem Hrs (3–0).* A first course in probability theory and statistics covering the following topics: *Probability*—Sets; sample spaces and events; conditional probability and independence; one-dimensional random variable; distribution functions; sums of random variables; *Statistics*—Sampling, estimation of parameters; testing hypotheses. *Prereq: M215* or *M221.*

M311 ANALYSIS V–B. *Four Sem Hrs (4–0).* A composite course covering the following topics in probability, statistics, and linear programming: *Probability*—Sets; sample spaces and events; conditional probability and independence; one-dimensional random variable; distribution functions; sums of random variables; *Statistics*—Sampling; estimation of parameters; testing hypotheses; *Linear Programming*—Linear inequalities; min-max problems; transportation problem; simplex method; game theory. *Prereq: M152, M213, or M215.*

Mathematics

M502 FUNDAMENTALS OF MATHEMATICS. *Three Sem Hrs (3–0).* Logic; the number system; logic of algebra; mathematical induction; cardinal number; groups.

M601 MATRIX THEORY *Three Sem Hrs (3–0).* Algebra of matrices; transformations; bilinear forms; rank; systems of linear equations; quadratic forms; linear vector spaces; determinants; characteristic matrix. *Prereq: M120, M152, or M213.*

M602 MODERN ALGEBRA. *Three Sem Hrs (3–0).* Fundamental concepts; sets, relations, operations; rings; integers; fields; number fields; rational numbers, real numbers, complex numbers, groups; algebra of matrices. *Prereq: M120, M152, or M213.*

M604 NUMERICAL ANALYSIS. *Three Sem Hrs (3–0).* Practical solution of algebraic and transcendental equations; finite differences and their applications; numerical integration of initial value problems; numerical integration of ordinary boundary value problems. *Prereq: M120, M152, or M213.*

M606 PROBABILITY AND STATISTICS II. *Three Sem Hrs (3–0).* Sampling theory; analysis of pairs of measurements; theoretical frequency functions for correlation and regression; the chi-square distribution; small sample theory (student's *T* and *F* distribution); general principles for testing hypotheses and for estimation; non-parametric methods. *Prereq: M218, M309, or M311.*

M608 VECTOR ANALYSIS. *Three Sem Hrs (3–0).* Geometry and algebra of vectors; vector calculus and vector fields; line and surface integrals; Stokes' and Gauss' theorems; applications. *Prereq: M215 or M221.*

M652 VECTOR MECHANICS. *Three Sem Hrs (3–0).* Vectors; velocity and acceleration components; impulse-momentum; work energy; conservative forces and potential energy, momentum; central forces; inverse-square law; Kepler's laws; velocity patterns and reference frames; plane and general motion of a rigid body; theorem of Coriolis; dynamics of a rigid body; conservative force fields; equilibrium of fluids; gradient, curl; Stokes' theorem; divergence; equation of continuity. *Prereq: M215 or M221.*

M671 LINEAR PROGRAMMING. *Three Sem Hrs (3–0).* The transportation problem, the simplex algorithm, the dual problem, the final tableau and an introduction to game theory. *Prereq: M601.*

M704 MATHEMATICS FOR ENGINEERS AND PHYSICISTS. *Three Sem Hrs (3–0).* To include topics from matrix theory, vector analysis, partial differential equations, complex variables. *Prereq: M218, M220, M221, M224, or M226.*

M721 ADVANCED CALCULUS I. *Three Sem Hrs (3–0).* Real and complex number systems; set theory; numerical sequences and series; continuity; differentiation; the Riemann Stieltjes integral; sequences and series of functions. *Prereq: M218, M220, M221, M224, or M226.*

M722 ADVANCED CALCULUS II. *Three Sem Hrs (3–0).* Power series; Fourier series; orthogonal functions; functions of several variables; integration. *Prereq: M721.*

M751 ENGINEERING MATHEMATICS I. *Three Sem Hrs (3–0).* Vector analysis; line, surface and volume integrals; Green's theorem, Stokes' theorem; Fourier analysis; partial differential equations, Bessel function, applications, Legendre polynominal, differentiation under the integral sign. *Prereq: M218, M220, M221, M224, or M226.*

M752 ENGINEERING MATHEMATICS II. *Three Sem Hrs (3–0).* Laplace transformation and selected supporting topics from complex variable (analytic functions, residues, etc.). *Prereq: M218, M220, M221, M224, or M226.*

M770 INTRODUCTION TO MATHEMATICAL ECONOMICS. *Three Sem Hrs (3–0).* Simple dynamic models; theory of the multiplier; the acceleration principle; lienar difference equations; trade-cycle theory; economic regulation and allocation of resources. *Prereq: M215, M218, M220, or M221; M601 and permission of the instructor.*

M802 INTRODUCTION TO COMPLEX VARIABLE. *Three Sem Hrs (3–0).* Analytic functions; elementary functions; integrals; series; residues and poles; conformal mapping and applications; analytic continuation Riemann surfaces. *Prereq: M721.*

M825 METHODS OF APPLIED MATHEMATICS I. *Three Sem Hrs (3–0).* Programming in FORTRAN; summation of series; truncation error; solution of equations by iterative methods; computations associated with matrices; characteristic value problems; interpolation; mechanical quadratures; difference and differential equations. *Prereq: M601, M721, and permission of the instructor.*

M826 METHODS OF APPLIED MATHEMATICS II. *Three Sem Hrs (3–0).* Review of classical methods for the initial value problem in differential equations; Euler-Cauchy, Adams, Milne, Runga-Kutta methods; prediction and correction iterations; convergence and stability; deferred iteration; two-point boundary value problems and eigenvalue problems; strong, inherent, and partial instability. Numerical solutions of partial differential equations. *Prereq: M825, M751, and permission of the instructor.*

M852 OPERATIONAL METHODS. *Three Sem Hrs. (3–0).* Application of Laplace and Fourier transforms to the analysis of the problems of science and engineering involving ordinary differential equations and the boundary value problems of partial differential equations. *Prereq: M802, and permission of instructor.*

M861 LINEAR ALEBRA. *Three Sem Hrs (3–0).* An abstract treatment of vector spaces and linear transformations with applications to algebra, analysis, and geometry. *Prereq: M601, M602, M722, and permission of instructor.*

M862 ADVANCED DIFFERENTIAL EQUATIONS I. *Three Sem Hrs (3–0).* A modern treatment of existence, uniqueness, oscillation and comparison theorems. The theory of stability of solutions. Topological methods. *Prereq: M722, and permission of instructor.*

M863 ADVANCED DIFFERENTIAL EQUATIONS II. *Three Sem Hrs (3–0).* Plane autonomous systems; approximate solutions; stability, regular singular points; Sturm-Liouville systems; expansions in eigenfunctions. *Prereq: M802, M862, and permission of instructor.*

M864 TOPOLOGY. *Three Sem Hrs. (3–0).* Topics to include sets and functions, metric spaces, topological spaces, compactness, separation, connected—ness, tone-Weierstrauss theorem, and an introduction to Banac and Hilbert spaces. *Prereq: M601, M602, M721, and permission of instructor.*

M866 ALGEBRAIC STRUCTURES. *Three Sem Hrs (3–0).* Groups; structure theorems; extension fields; elements of Galois theory. *Prereq: M602, M722, and permission of instructor.*

M902–903. MATHEMATICS RESEARCH PROJECT. *Three Sem Hrs Each Term (3–0, 3–0).* A creative, mathematics research project in the field of the student's interest, approved by the Mathematics Research Adviser in the Department. If the project is of sufficient magnitude or depth, it may be continued for a second semister. *Preq: Approvel of Head of Department.*

Modern Languages Department

Head of Department: Captain K. G. Haynes; **Executive Officer:** Commander G. D. Florence; **Senior Professor:** J. D. Yarbro; **Professors:** C. P. Lemieux, R. F. Muller, H. W. Drexel, W. H. Barry, J. H. Elsdon, G. J. Riccio, J. E. Griffiths, R. A. Farley; **Associate Professors:** W. H. Buffum, C. R. Michaud, H. R. Keller, Jr., C. A. Pritchard, K. E. Lappin, W. W. Sewell, K. P. Roderbourg, E. J. Satterthwaite, J. A. Hutchins, E. A. DeRosa; **Lieutenant Commanders:** M. A. Cardosa de Castro, Brazilian Navy; I. Fleuriot de Langle, French Navy; G. Fazio, Italian Navy; C. von Criegern, Federal German Navy; **Assistant Professors:** V. S. Tolstoy, R. J. Trivelli; D. T. Y. Lee; **Lieutenants/Captains:** G. Cadwalader (USMC), A Ortega, Mexican Navy, W. F. Ritzman, N. J. LaMadeleine, R. K. Lawton; **Instructor:** M. E. Grivsky; **Ensign:** H. W. Bogart.

Mission

The Modern Languages Department provides opportunities for midshipmen to develop proficiency in any of seven languages, and to gain significant knowledge of the related foreign areas, peoples, and cultures.

Facilities

The Department is equipped with a tape-recording studio, high-speed tape duplicators, extensive tape libraries, and language laboratory facilities. Tapes for all lessons in the basic and intermediate courses are supplied to midshipmen, and some 900 tape recorder-playback units are loaned for use in individual midshipmen's rooms in Bancroft Hall.

A variety of tape-recorded material is also available for class or individual use in advanced elective courses. Visual aids, such as sound motion picture films, transparencies, slides, pictures, charts, and maps are used to highlight geographic, cultural, and other background features of the areas and civilizations under discussion.

CORE COURSES

L101–102C Basic Chinese
L101–102F Basic French
L101–102G Basic German
L101–102I Basic Italian
L101–102P Basic Portugese
L101–102R Basic Russian
L101–102S Basic Spanish

MINORS PROGRAM

French

L201–202F	Intermediate French
L701–702F	Advanced French
L805–806F	French Area and Civilization

Italian

L201–202I	Intermediate Italian
L701–702I	Advanced Italian
L805–806I	Italian Area and Civilization

Russian

L201–202R	Intermediate Russian
L703–704R	Advanced Russian
L805–806R	Russian Area and Civilization

German

L201–202G	Intermediate German
L701–702G	Advanced German
L805–806G	German Area and Civilization

Portuguese

L201–202P	Intermediate Portuguese
L701–702P	Advanced Portuguese
L805–806P	Brazilian and Portuguese Area and Civilization

Spanish

L201–202S	Intermediate Spanish
L701–702S	Advanced Spanish
L807S	Spanish Civilization
L808S	Spanish-American Civilization

Note: L201–202 may be validated. In special cases, with approval of the Head of Department, certain 700–800 level language courses may be substituted for those listed above.

MAJORS PROGRAM

Requirements are 36 semester hours (including L101–102) in the same language. Six of these hours are to be selected from optional courses marked by asterisk.

French

L201–202F	Intermediate French
L701–702F	Advanced French
L713–714F	Survey of French Literature
L805–806F	French Area and Civilization
L811–812F	Contemporary French Literature*
L813F	The Age of Ideas in French Literature*
L814F	The Nineteenth Century Novel in France*
L815F	Selected Plays of the French Theater*
L817F	Techniques of Translation*
L822F	The French Navy*
L901–902F	Independent Foreign Language Study Project*

Italian

L201–202I	Intermediate Italian
L701–702I	Advanced Italian
L713–714I	Survey of Italian Literature
L802	Dante and His Times
L805–806I	Italian Area and Civilization
L822I	The Italian Navy
L901–902I	Independent Foreign Language Study Project

Russian

L201–202R	Intermediate Russian
L703–704R	Advanced Russian
L705–706R	The Soviet Press*
L711–712R	Scientific Russian*
L713–714R	Survey of Russian Literature
L802R	The Nineteenth Century Russian Novel*
L803R	Anton P. Chekhov*
L805–806R	Russian Area and Civilization
L822R	The Soviet Navy*
L901–902R	Independent Foreign Language Study Project*

German

L201–202G	Intermediate German
L701–702G	Advanced German
L713–714G	Survey of German Literature
L801–802G	Goethe, Schiller, and Lessing*
L805–806G	German Area and Civilization
L807–808G	German Naval History*
L811–812G	German Literature of the Twentieth Century*
L715–716G	Scientific German*
L901–902G	Independent Foreign Language Study Project*

Portuguese

L201–202P	Intermediate Portuguese
L701–702P	Advanced Portuguese
L713–714P	Survey of Brazilian and Portuguese Literature
L805–806P	Brazilian and Portuguese Areas and Civilization
L807P	Modern Brazilian Novel
L822P	Brazilian Naval History
L901–902P	Independent Foreign Language Study Project

Spanish

L201–202S	Intermediate Spanish
L701–702S	Advanced Spanish
L713–714S	Survey of Spanish Literature
L805–806S	Survey of Spanish-American Literature*
L807S	Spanish Civilization
L808S	Spanish-American Civilization
L813S	Contemporary Spanish Literature*
L814S	Contemporary Spanish-American Literature*
L901–902S	Independent Foreign Language Study Project*

Course Descriptions

L101C & L102C BASIC CHINESE. *Three Sem Hrs Each Term (3–0, 3–0).* A beginning course in modern standard Chinese (Mandarin), concentrating on development of listening and speaking skills, and stressing high-frequency vocabulary. Grammar presented inductively. Includes introduction to the writing system. Preparation for recitations will be done largely with tape-recorded materials.

L101 & L102 BASIC FRENCH, GERMAN, ITALIAN, PORTUGUESE, RUSSIAN, SPANISH. *Three Sem Hrs Each Term (3–0, 3–0).* A foundation course concentrating on development of hearing and speaking skills. Aims at fluency in use of speech patterns exemplifying the basic structures of the language, with control of basic vocabulary and simple phraseology of everyday situations. Basic reading skill is a secondary goal. Writing is limited to material first mastered orally.

L101E & L102E ENGLISH FOR NON-NATIVE SPEAKERS. *Three Sem Hrs Each Term (3–0, 3–0).* This course is designed as an alternate to H101–102 for midshipmen who are not native speakers of English and who need to strengthen their proficiency in this language. Aims to develop skills in understanding, speaking, reading, and writing. Includes extensive aural-oral drills on pronunciation, intonation, and speech patterns, rapid-reading exercises, general conversation, practice in theme writing, and a thorough review of grammar. *Prereq: Permission of Head of Modern Languages Department, following recommendation of Head of English, History, and Government Department.*

Modern Languages

L201 & L201C INTERMEDIATE CHINESE. *Three Sem Hrs Each Term (3–0, 3–0).* Continues development of listening and speaking skills and understanding of structure. Provides exercises in character recognition, and reading of modern texts of value both for practical language and cultural content. *Prereq: L101–102C or equivalent.*

L201 & L202 INTERMEDIATE FRENCH, GERMAN, ITALIAN, PORTUGUESE, RUSSIAN, SPANISH. *Three Sem Hrs. Each Term (3–0, 3–0).* Continues emphasis on oral work and mastery of speech patterns; develops reading and writing skills; includes area and cultural topics in conversations and readings. *Prereq: L101–102 or equivalent.*

L701 & L702 ADVANCED FRENCH, GERMAN, ITALIAN, PORTUGUESE, SPANISH, and L703 & L704 ADVANCED RUSSIAN. *Three Sem Hrs Each Term (3–0, 3–0).* Designed for students who, possessing good intermediate knowledge and skills in their foreign language, are ready to expand their active vocabulary and develop lasting proficiency in speaking, reading, and writing. Provides ample practice in oral expression, with conversations and brief reports on selected topics, and in writing, with systematic exercises on advanced syntax and idiomatic phrasing. Conducted in the foreign language. *Prereq: L201–202 or equivalent.*

L901 & L902 INDEPENDENT FOREIGN LANGUAGE STUDY PROJECT. *Three Sem Hrs Each Term (3–0, 3–0).* Offered in French, German, Italian, Portuguese, Russian, or Spanish. For especially well qualified midshipmen who, after completing the minor in a language, desire to carry out an independent reading-study program in that language. Individual projects will normally deal with topics or readings in the fields of literature, area, and civilization. Each project must be approved by the prospective instructor and by the head of the language division concerned. May be taken for one semester or for two. *Prereq: Completion of minor in language concerned and permission of the Head of Modern Languages Department.*

Chinese

L701C & L702C ADVANCED CHINESE. *Three Sem Hrs Each Term (3–0, 3–0).* Designed to build proficiency in use of spoken language. Progressively develops competence in reading. Conversations and readings based on area and cultural topics. *Prereq: L201–202C or equivalent.*

L801C & L802C READINGS AND DISCUSSIONS IN MODERN CHINESE. *Three Sem Hrs Each Term (3–0, 3–0).* Reading of selected Chinese texts dealing with major aspects of Chinese areas, civilization, and culture, with discussions in Chinese. *Prereq: L701–702C or equivalent.*

French

L713F & L714F SURVEY OF FRENCH LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Comprehensive study of major French works from the Middle Ages to the present, with emphasis on those essential to an understanding of the French character and cultural heritage. Conducted in French. Two terms, but each term may be taken independently. *Prereq: L701–702F, or permission of Head of Department.*

L805F & L806F FRENCH AREA AND CIVILIZATION. *Three Sem Hrs Each Term (3–0, 3–0).* Readings and discussions leading to broadened knowledge and understanding of France and the French people today. Topics include the major aspects of French history, geography, resources, economy, government, institutions, and present-day cultural life. Conducted in French. Two terms, but each term may be taken independently. *Prereq: L701–702F, or permission of Head of Department.*

L811F & L812F CONTEMPORARY FRENCH LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Reading and discussion of selected works of the most significant modern French authors including Proust, Gide, Romains, Mauriac, Malraux, Sartre, and Camus. Emphasis given to the social, moral, and intellectual currents influencing French life and attitudes from 1900 to the present. Text analysis, critical discussion, and lectures. Conducted in French. Two terms, but each term may be taken independently. *Prereq: L701–702F, or permission of Head of Department.*

L813F THE AGE OF IDEAS IN FRENCH LITERATURE. *Three Sem Hrs (3–0).* Study and discussion of French 18th-century thought as expressed in literature. Included are "les philosophes," Montesquieu, Diderot and *l'Encyclopédie,* Voltaire, and Rousseau. Conducted in French. *Prereq: L701–702F, or permission of Head of Department.*

L814F THE NINETEENTH CENTURY NOVEL IN FRANCE. *Three Sem Hrs (3–0).* Reading and discussion of works of Vigny, Balzac, Stendhal, Flaubert, Zola, and others. Conducted in French. *Prereq: L701–702F, or permission of Head of Department.*

L815F SELECTED PLAYS OF THE FRENCH THEATER. *Three Sem Hrs (3–0).* Reading and discussion of plays of representative French dramatists including Molière, Racine, Corneille, Beaumarchais, Hugo, Rostand, and Pagnol. Conducted in French. *Prereq: L701–702F, or permission of Head of Department.*

L817F TECHNIQUES OF TRANSLATION. *Three Sem Hrs (3–0).* Analysis of basic techniques and procedures for accurate translation, French to English and English to French. Familiarization with use of principal tools: selected dictionaries, glossaries, manuals, and other reference works. Extensive practice in translating materials (from professional, social and literary fields) chosen for their usefulness to naval officers. *Prereq: L701–702F, or permission of Head of Department.*

L822F THE FRENCH NAVY. *Three Sem Hrs (3–0).* Starting with a brief survey of French naval history and traditions, this course deals with the present-day French Navy. Main topics are its organization ashore and afloat, ships, equipment, materiel, personnel, and training programs, as well as its mission, doctrines, and strategy. Readings, discussions, and reports based on current French military and naval publications. Conducted in French. *Prereq: L701–702F, or permission of Head of Department.*

German

L713G & L714G SURVEY OF GERMAN LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Comprehensive study of major German works of the various periods. Emphasis given to those essential to understanding of German thought and attitudes. Conducted in German. Two terms, but each term may be taken independently. *Prereq: L701–702G, or permission of Head of Department.*

L715 & L716G SCIENTIFIC GERMAN. *Three Sem Hrs Each Term (3–0, 3–0).* Advanced reading and discussion of current German scientific and technical writings. Materials selected from periodicals, science textbooks, and reference works. Collateral readings and oral reports. Conducted in German. Two terms, but each term may be taken independently. *Prereq: L701–702G, or permission of Head of Department.*

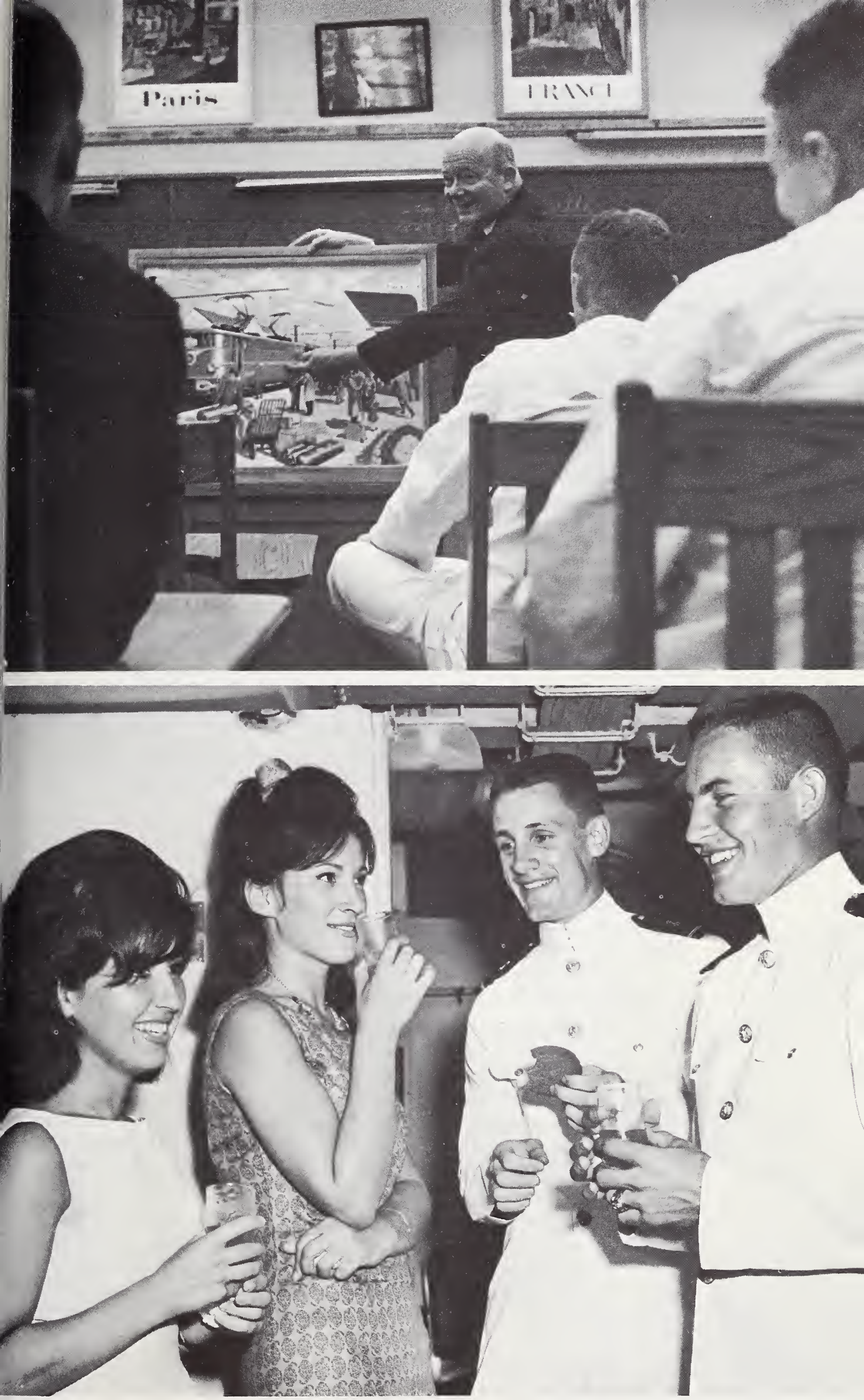
Modern Languages

L801G & L802G. GOETHE, SCHILLER, AND LESSING. *Three Sem Hrs Each Term (3–0, 3–0).* Selected works from the three greatest German writers. Their influence on the literature and history of the times will be emphasized. Conducted in German. Two terms, but each term may be taken independently. *Prereq: L701–702G, or permission of Head of Department.*

L805G & L806G GERMAN AREA AND CIVILIZATION. *Three Sem Hrs Each Term (3–0, 3–0).* Readings and discussions designed to provide thorough knowledge and understanding of Germany and the German people today. The history of the many nations which make up modern Germany are discussed. Other topics include geography, resources, economy, government, institutions, present-day civilization and culture, and Germany's role in current affairs. Conducted in German. Two terms, but each term may be taken independently. *Prereq: L701–702G, or permission of Head of Department.*

L807G & L808G GERMAN NAVAL HISTORY. *Three Sem Hrs Each Term (3–0, 3–0).* Readings and discussion of German naval concepts and activities, with emphasis on World War II. This course is designed to broaden the midshipman's knowledge of naval-military history and to give him a better perspective of his chosen profession. From the standpoint of language, the class conversations develop active control of naval-military terminology, as well as standard vocabulary. Conducted in German. Two terms, but each term may be taken independently. *Prereq: L701–702G, or permission of Head of Department.*

L811G & L812G GERMAN LITERATURE OF THE TWENTIETH CENTURY. *Three Sem Hrs Each Term (3–0, 3–0).* Study and discussion of literary movements and selected authors: Hauptmann, Mann, Hesse, Borchert, Kafka, Langgässer, Wiechert, Schnitzler, von Hofmannsthal, Dürrenmatt and others. Conducted in German. Two terms, but each term may be taken independently. *Prereq: L701–702G, or permission of Head of Department.*


Paris
FRANCE

Students of French—at home and abroa

Italian

L713I & L714I SURVEY OF ITALIAN LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Reading and discussion of major works from the pre-Renaissance period to modern times. Emphasis given to works which best exemplify the Italian character and cultural heritage. Conducted in Italian. Two terms, but each term may be taken independently. *Prereq: L701–702I, or permission of Head of Department.*

L802I DANTE. *Three Sem Hrs (3–0).* The *Divina Commedia* is read and discussed not only as a reflection of religious, philosophical, political, literary, and social values in Dante's times, but also as a source of enduring influence on present-day intellectual and cultural life in Italy and throughout the western world. The relevance of Dante's work to modern Italy is emphasized. Conducted in Italian. *Prereq: L701–702I, or permission of Head of Department.*

L805I & L806I ITALIAN AREA AND CIVILIZATION. *Three Sem Hrs Term (3–0, 3–0).* Readings and discussions designed to provide extensive knowledge and understanding of Italy and the Italian people of today. Topics include the major aspects of Italian history, geography, resources, economy, government, institutions, and present day civilization. Conducted in Italian. Two terms, but each term may be taken independently. *Prereq: L701–702P, or permission of Head of Department.*

L822I THE ITALIAN NAVY. *Three Sem Hrs (3–0).* Starting with a brief historical survey of its origins and traditions, and its activities in the two World Wars, this course deals primarily with the Italian Navy in the contemporary period. Main topics are its mission and doctrines, organization ashore and afloat, ships, equipment, personnel, and training programs. Readings, reports, and discussions are based on current Italian military and naval publications. Conducted in Italian. *Prereq: L701–702I, or permission of Head of Department.*

Portuguese

L713P & L714P SURVEY OF BRAZILIAN AND PORTUGUESE LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Reading and discussion of major works which best illustrate the national characteristics, life, and attitudes of the Brazilian and Portuguese peoples. Conducted in Portuguese. Two terms, but each term may be taken independently. *Prereq: L701–702P, or permission of Head of Department.*

L805P & L806P BRAZILIAN AND PORTUGUESE AREAS AND CIVILIZATION. *Three Sem Hrs Each Term (3–0, 3–0).* Readings and discussions designed to provide extensive knowledge and understanding of Brazil and Portugal and their peoples. Topics include the major aspects of Portuguese and Brazilian history, character of populations, geography, economy, governments, institutions, development projects, and cultural life. Conducted in Portuguese. Two terms, but each term may be taken independently. *Prereq: L701–702P, or permission of Head of Department.*

L807P MODERN BRAZILIAN NOVEL. *Three Sem Hrs (3–0).* Study and discussion of representative works by contemporary novelists such as Jorge Amado, Graciliano Ramos, Jose Lins do Rego, Rachel de Queiroz, and Erico Verissimo. Conducted in Portuguese. *Prereq: L701–702P, or permission of Head of Department.*

L822P BRAZILIAN NAVAL HISTORY. *Three Sem Hrs (3–0).* Starting with a study of the Portuguese era of maritime discovery and colonization, the course continues with these topics: establishment of the Brazilian Navy in 1808; maritime development and naval operations in the 19th century; role of the Brazilian Navy in both World Wars; present-day Brazilian defense and naval organization and doctrines; the modern Brazilian Navy; United States-Brazilian defense relations, with emphasis on naval affairs; and Operations Unitas. Readings, discussions, and reports based on Portuguese and Brazilian naval-military periodicals, books, and documents. Conducted in Portuguese. *Prereq: L701–702P, or permission of Head of Department.*

Russian

L705R & L706R THE SOVIET PRESS. *Three Sem Hrs Each Term (3–0, 3–0).* An introduction to the style and content of the Soviet press. Current Russian publications will be read and analyzed with attention to the selective nature of the Soviet press. In addition to giving insight into current problems of Soviet policy, this course aims to prepare the midshipman for research in the field of Russian and Soviet affairs. Conducted in Russian. Two terms, but each term may be taken independently. *Prereq: L703–704R, or permission of Head of Department.*

L711R & L712R SCIENTIFIC RUSSIAN. *Three Sem Hrs Each Term (3–0, 3–0).* An advanced reading course in current Soviet scientific literature. Material selected from periodicals, textbooks, and encyclopedias. Attention given to administrative framework of theoretical and applied research. Conducted in Russian. Two terms, but each term may be taken independently. *Prereq: L703–704R, or permission of Head of Department.*

L713R & L714R SURVEY OF RUSSIAN LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Reading and discussion of selections which best illustrate Russian life, character traits, attitudes, and environment. Conducted in Russian. Two terms, but each term may be taken independently. *Prereq: L703–704R, or permission of Head of Department.*

PER A
DANIELS '71

L802R THE NINETEENTH CENTURY RUSSIAN NOVEL. *Three Sem Hrs (3–0).* Readings from the works of L. N. Tolstoy, I. S. Turgenev, F. M. Dostoevsky. Reports and discussions in Russian. Conducted in Russian. *Prereq: L703–704R, or permission of Head of Department.*

L803R ANTON P. CHEKHOV. *Three Sem Hrs (3–0).* Study of selected plays and short stories of A. P. Chekhov. Objective is to increase mastery of contemporary Russian vocabulary and to develop an understandnig of Chekhov's world. Conducted in Russian. *Prereq: L703–704R, or permission of Head of Department.*

L805R & L806R RUSSIAN AREA AND CIVILIZATION. *Three Sem Hrs Each Term (3–0, 3–0).* Readings and discussions designed to provide extensive knowledge and understanding of Russia and the Soviet peoples. Topics include the major aspects of Russian history, character of populations, geography, resources, government, institutions, and cultural life. Conducted in Russian. Two terms, but each term may be taken independently. *Prereq: L703–704R, or permission of Head of Department.*

L822R THE SOVIET NAVY. *Three Sem Hrs (3–0).* A study of the present character and potential of the Soviet Navy. Brief historical introduction, followed by discussions and reports on current Russian naval organization, doctrine, strategy, personnel, training programs, theaters of operation, ships and materiel. Group assignments and individual collateral readings based on Russian military and naval periodicals, newspapers, pamphlets, and books. Conducted in Russian. *Prereq: L703–704R, or permission of Head of Department.*

Spanish

L713S & L714S SURVEY OF SPANISH LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Reading and discussion of works which best illustrate the Spanish character and personality, attitudes, environment, and cultural heritage. The program includes masterpieces from the various periods with background readings and lectures on the major literary movements. Conducted in Spanish. Two terms, but each term may be taken independently. *Prereq: L701–702S, or permission of Head of Department.*

L805S & L806S SURVEY OF SPANISH-AMERICAN LITERATURE. *Three Sem Hrs Each Term (3–0, 3–0).* Readings and discussion of works which best illustrate Spanish-American characters, attitudes, environment, and cultural life. Includes major works from various countries, with background readings and lectures on major literary movements. Conducted in Spanish. Two terms, but each term may be taken independently. *Prereq: L701–702S, or permission of Head of Department.*

L807S SPANISH CIVILIZATION. *Three Sem Hrs (3–0).* Readings and discussions on the most significant aspects of Spain's history, people, geography, resources, institutions, and cultural life. Conducted in Spanish. *Prereq: L701–702S, or permission of Head of Department.*

L808S SPANISH-AMERICAN CIVILIZATION. *Three Sem Hrs (3–0).* Readings and discussion on the areas and peoples of Spanish America, with emphasis given to major aspects of geography, resources, history, institutions, and customs of selected countries. Conducted in Spanish. *Prereq: L701–702S, or permission of Head of Department.*

L813S CONTEMPORARY SPANISH LITERATURE. *Three Sem Hrs (3–0).* Reading and discussion of novels, plays, essays, and poetry of outstanding writers beginning with Modernism. Conducted in Spanish. *Prereq: L701–702S, or permission of Head of Department.*

L814S CONTEMPORARY SPANISH-AMERICAN LITERATURE. *Three Sem Hrs (3–0).* Reading and discussion of novels, plays, essays, and poetry reflecting major literary, social, and philosophical movements from the late nineteenth century to the present. Conducted in Spanish. *Prereq: L701–702S, or permission of Head of Department.*

Naval Science Department

Head of Department: Captain W. C. Nicklas; **Executive Officer:** Commander R. T. Duncan, Jr.; **Senior Professor:** G. J. Mann; **Commanders/Lieutenant Colonels:** J. F. Foster, J. J. MacPherson, E. J. Christensen, C. O. Anderson, D. D. Beal, (USMC), J. D. Dancer, R. M. Olsen, "S" P. Halle, III, D. A. McGuiness, T. J. Johnson, S. R. Golanka; **Associate Professors:** J. Williams, C. N. G. Hendrix, J. F. Hoffman, E. D. Traganza; **Lieutenant Commanders/Majors:** L. B. Greene, E. E. Inman, Jr., A. Morano, G. J. Ertlmeier, (USMC), A. G. Brookes, Jr., R. C. Rydzewski, W. G. Schramm, J. P. Thomas, R. D. Kelley, "J" P. London; **Assistant Professors:** N. L. Tate, R. C. Boys, G. B. Hannah, R. S. Kilcourse, C. T. Latimer, K. Montor, R. E. Steed; **Lieutenants/Captains:** C. W. Ehler, J. H. Reed, W. J. Bakula, Jr., C. E. Davis, H. W. Fox, J. B. Tupaz, J. A. Cooper, R. E. Gasser, J. Tranchini, S. J. Bailey, Jr., L. D. McCullough, J. B. Sharp, Jr., E. M. Byrne, W. J. Rodriguez, R. F. DeWalt, R. H. Smith, T. M. McNicholas, Jr., J. A. Smith, R. L. Farnan, T. H. Cramer, B. T. Steele, R. A. Garrett, J. E. Barker, B. R. Campbell, W. H. Levings, III, G. A. Nelson, J. C. Maheu, P. M. Tansey, D. T. Travis, A. D. Zabrocki, C. W. J. Stanat, (USMC), F. P. Roll, C. L. Harkness, (USMC), K. R. Buell, M. T. Corgan, M. J. Hart, J. A. Maxwell, W. L. Hansen, R. L. Weidman, P. A. Browne, F. R. Whalen, W. E. Davis, T. L. Sopwith, R. S. Bell, J. R. Seeley, R. F. Weir, N. R. Blinn, P. K. Rogers, III, W. T. Rayder, R. G. Porter, R. P. Zimmermann, J. H. Minan; **Lieutenants (j.g.):** S. J. Kowalick, Jr., R. J. Pangallo.

Mission

The mission of the Naval Science Department is to provide midshipmen with the fundamental concepts and principles of naval science and with the professional naval knowledge necessary to establish a sound basis for future growth as naval officers. Academic studies encompass leadership and management, meteorology and oceanography, navigation, naval operations and operations analysis.

Practical applications of all aspects of shipboard operations including leadership, seamanship, shiphandling, communications, and shipboard organization are presented throughout the four years both in the classrooms and afloat on board the Academy's yard patrol craft. The midshipman is thus developed professionally for service as a career naval officer through both classroom study and practical experience.

Facilities

The Naval Science Department is located in Luce Hall, named for Rear Admiral Stephen B. Luce, founder and first President of the Naval War College. In addition to classrooms, Luce Hall contains a large Navigation Plotting Room, a Planetarium, four fully equipped Combat Information Center (CIC) Training Rooms, and a new Environmental Science Laboratory. The Plotting Room seats 500 at plotting desks for navigation practical work and for examinations.

The Environmental Science Laboratory, established during the 1967 spring semester, is used in support of the oceanography major and minor programs. Additionally, one of the Academy's yard patrol craft has been instrumented for use in obtaining oceanographic data.

The planetarium is used in teaching astronomy, aerospace environment, and celestial navigation. With the Spitz A–3–P Projector and associated auxiliary projectors, it is possible to simulate the sky as it would appear from any point on earth, at any time of day or night. The complete sequence of events leading to the determination of position at sea by use of the stars, sun, moon, and planets can be portrayed with this device.

During the winter months, instruction in tactical doctrine and procedures is carried out in the CIC Training Rooms. Advanced tactical procedures in anti-submarine and anti-air-warfare situations are covered. Full-scale fleet tactical exercises, simulated in the CIC's to evoke command decisions, include voice radio communications, radar presentations, air raids, and tactical plots.

Instruction in shipboard operations and evolutions is conducted on board the Academy's yard patrol craft, commonly called YP's. These 80-foot diesel-powered ships are exceptionally well equipped to provide training and instruction in seamanship, navigation, communications, and tactics. As plebes, the midshipmen perform the functions of helmsman, lookout, signalman, and telephone talker. During Second Class Summer the midshipmen again have the opportunity to polish their classroom knowledge with a four-week period aboard the YP's. Midshipmen participate in increasingly complex evolutions aboard the YP's during Second Class and First Class Years. A final advanced exercise, headed by First Classmen in command and control positions, completes the afloat training program.

CORE COURSES

N101 Fundamentals of Naval Science
N208 Navigation I
N311 Operations and Tactics I
N313 Navigation II
N318 Naval Operations Analysis
N409 Leadership and Military Law
N415 Operations and Tactics II

MINORS PROGRAM

Management

N601 General Psychology
N610 Principles of Management
N701 Financial Management
N702 Material Management
N813 Personnel Administration

Plus one of the following:
N802 Organizational Behavior
N822 Advanced Studies in Management
H841 The Economics of Defense

Oceanography

N603 Oceanography
N607 Meteorology
N705 Ocean Waves, Tides, and Ice
N708 Synoptic Meteorology
N821 Nearshore Oceanography
N832 Oceanographic Applications

Operations Analysis

M601 Matrix Theory
M606 Probability and Statistics
N707 Games of Strategy
N823 Methods of Operations Analysis
N824 Applications of Operations Analysis

Plus one of the following:
M671 Linear Programming
N710 Decision Theory
N714 War Gaming
N808 Naval Strategy and Military Planning

Naval Science

MAJORS PROGRAM

Management

Completion of the six-course Management minor is required plus six additional courses as follow:

Two of the following courses:

W707 Digital Computers
N802 Organizational Behavior*
N822 Advanced Studies in Management*
N902 Research Project (*or* N903)

One of the following:

M601 Matrix Theory
M606 Probability and Statistics
H845 Public Finance
H751 Economic Statistics

One of the following:

M770 Introduction to Mathematical Economics
N710 Decision Theory
H753 Price Determination and Decision Making

Two of the following:

H752 Econometrics
H841 The Economics of Defense*
H846 Economics of Labor Relations
H848 Money and Banking
H840 Elements of Law

**May be take in the major program if not taken to satisfy the minor program.*

Oceanography

Completion of the six-course Oceanography minor is required plus six additional courses as follows:

One of the following combinations:

S609–S610	General Biology I and II
S611–S612	General Geology I and II

Two of the following:

M601	Matrix Theory
M608	Vector Analysis
M751	Engineering Mathematics I
M752	Engineering Mathematics II
M721	Advanced Calculus I
M722	Advanced Calculus II

One of the following combinations:

S721	Theoretical Physics I
S722	Theoretical Physics II
	or
S733	Physical Chemistry I
S734	Physical Chemistry II
	or
S704	Principles of Underwater Acoustics
S705	Sonar

Operations Analysis

Completion of the six-course Operations Analysis minor is required plus six of the following additional courses:

M671	Linear Programming*
N710	Decision Theory*
N714	War Gaming*
M770	Mathematical Economics
N808	Naval Strategy and Military Planning*
H841	Advanced Economics and Problems of Defense Planning
N902	Research Project

**May be taken in the major program if not taken to satisfy the minor program.*

Course Descriptions

N101 FUNDAMENTALS OF NAVAL SCIENCE. *Four Sem Hrs (3–2).* An introductory course designed to provide the Fourth Class Midshipman with the basic knowledge required to take full advantage of his Third Class Summer At-Sea Training. The midshipman acquires a basic familiarity with the various equipages and systems found on U.S. Navy ships and becomes aware of the many organizational, administrative, and operational details needed to work and live in a shipboard environment. The interdependence of shipboard departments and the coordination required in carrying out the necessary details to make the ship an effective weapon system are stressed throughout. In addition, the midshipman is introduced to the essential elements of shipboard leadership and the air/ocean environment to better appreciate their effects on modern naval operations.

N105 AIR-OCEAN ENVIRONMENT. *Three Sem Hrs (3–0).* Designed to familiarize the prospective naval officer with the impact of the marine environment upon naval operations. The subject is approached from a viewpoint that integrates the hydrosphere-atmosphere as a system. Basic physical and hydrodynamic laws are presented, as applicable, to topics which include waves, tides, currents, temperature structure, chemical and biological aspects, and bottom topography of the oceans, and winds, synoptic weather, and violent storms of the atmosphere. Environmental effects upon navigation, sound, and radar propagation, man-in-the-sea, and survival are typical of implications to operating personnel and equipment stressed throughout the course. (Core course for Classes of '70 and '71.)

N106 INTRODUCTION TO PSYCHOLOGY AND LEADERSHIP. *Three Sem Hrs (3–0).* Instruction in the fundamental principles of psychology and human behavior with emphasis on the relevance of these principles to the practices of naval leadership. Instruction in the basic principles of management and organization with discussion of the procedures and techniques of applying human-relations principles to naval management. (Core course for Classes of '70 and '71.)

N208 NAVIGATION I. *Four Sem Hrs (3–2).* This first course in navigation provides an introduction to the materials and equipment, techniques, and procedures involved in safe marine navigation. The topical coverage begins with a study of the geographic coordinate system and the theory of the more commonly used chart projections. The student is introduced to basic principles of piloting, both visual and radar, and to navigational aids and chart symbolism. As he progresses, rules of the nautical road, the maneuvering board, and elementary naval tactics are integrated into the navigation picture. Rudimentary theory of current and prospective Fleet electronic navigation systems are also introduced. The student gains proficiency in the navigational techniques through application of classroom learning during weekly two-hour laboratory problem periods. *Prereq: 3/C at-sea training.*

N311 OPERATIONS AND TACTICS I. *Three Sem Hrs (2–2).* An introduction to naval communications and surface-ship operations in the classroom followed by practical instruction in shiphandling, basic formation maneuvers, and tactical communications drills during planned at-sea exercises on board yard patrol craft (YP's). This course is designed to provide midshipmen with the initial foundation of knowledge and experience required of the officer of the deck at sea. *Prereq: N208.*

LCDR MACKENZIE
NAVAL SCIENCE

Main corridor, Luce Hall, and Combat Information Center

N313 NAVIGATION II. *Three Sem Hrs (2–2).* Designed to develop theoretical knowledge and practical skills in celestial navigation. Topical coverage proceeds from an introduction to the navigation universe and the development of required coordinate systems, through an investigation of navigational time and the solution of the navigational triangle, to the subsequent determination of geographical position. Sextant theory and corrections to observations are treated. Advanced rules of the nautical road, the maneuvering board, and tactical maneuvering subjects are interspersed throughout the course. Weekly two-hour laboratory problem periods are used to reinforce classroom work through practical application. *Prereq: N311.*

N318 NAVAL OPERATIONS ANALYSIS. *Four Sem Hrs (3–2).* The application of operations analysis techniques of the solution of naval warfare problems. Emphasis is placed on providing the decision-maker with a quantitative evaluation of the alternative courses of action which may accomplish a given mission. Specific operational problems are studied in the employment of naval air, surface, and subsurface forces. Analytical techniques applicable to these problems are investigated through study of the basic principles of game theory, detection theory, radar-detection theory, search theory, the reliability of electronic equipment, and the physics of underwater sound. Utilization of these techniques is related to the evolution of some of the basic tactics described in current naval operational publications. Half the time in the laboratory is devoted to controlled exercises in CIC mock-up demonstration rooms. The Combat Information Center and its associated publications and equipment are utilized for collection, display, evaluation, and dissemination of information on air and surface targets. The remaining laboratory hours are spent on board the yard patrol craft (YP's) for familiarization with combined afloat operations and with CIC–Conn coordination procedures. *Prereq: N311; M309 or M311.*

N409 LEADERSHIP AND MILITARY LAW. *Three Sem Hrs (3–0).* Covers those aspects of military justice and international law which are of most use and importance to a junior officer. Group discussion and case study methods are used to analyze current leadership and management situations with emphasis on self-development and individual responsibility. *Prereq: N106 or equivalent, and 1/C at-sea training.*

N415 OPERATIONS AND TACTICS II. *One Sem Hr (0–2).* Employment of operational procedures while conducting multi-ship maneuvers in various formations aboard the yard patrol craft (YP's). Requires the midshipman to perform tasks generally required of junior officers on board surface units in the Fleet, while conducting progressively more complex multi-ship maneuvers in various advanced formations. Classroom work provides an introduction to the organization of the Department of Defense and the Department of the Navy. *Prereq: N313, N318.*

N601 GENERAL PSYCHOLOGY. *Three Sem Hrs (3–0).* An analysis of human behavior with specific reference to the biological and genetic basis of behavior; the study of cognitive, intellectual and other mental processes; an examination of the human personality structure and its development, both normal and deviant. The application of scientific methodology in the study of human behavior is introduced. Recognition of the psychological basis of interpersonal relationships and group dynamics necessary for effective leadership is a primary course objective. This course is a prerequisite for a management minor or major.

N603 GENERAL OCEANOGRAPHY. *Three Sem Hrs (3–0).* A combination of scientific principles, methods, and the body of knowledge unique to oceanography. Encompasses a study of the interaction of internal and external processes which determine the nature of the ocean environment. Beginning with an introduction to the theory of distribution of variables in the sea, the course deals with processes which (1) act on the bottom of the ocean, (2) determine the composition and properties of sea water, (3) are involved in energy transfer, (4) are associated with the equation of state, salt/heat transfer, continuity and motion, (5) which contribute to the theory of ocean currents and water masses, and (6) explain the cycle of life in the sea. Concludes with a review of regional oceanography and a final emphasis on interdisciplinary analysis of the ocean system. *Prereq: M120 or M152, S102; N105 (class of '70, '71).*

N607 GENERAL METEOROLOGY. *Three Sem Hrs (3–0).* Designed to apply the student's basic skills in the classical disciplines to the mechanisms and processes of the atmosphere. A detailed study of the composition of the atmosphere, weather elements, and instruments and observations initiates the course. Other topics include physics of the atmospheric variables, solar and terrestrial radiation, heat budget of the earth and atmosphere, thermodynamics of dry and moist air, condensation and precipitation processes, the equations of motion in the atmosphere, including the application of the concepts of divergence and vorticity, and the structure of air masses. The dynamics of fronts, pressure systems, and tropical storms are investigated. *Prereq: M120 or M152; N105 (for class of '70, '71).*

N609 PSYCHOLOGY: INDIVIDUAL DIFFERENCES. *Three Sem Hrs (3–0).* A study of the sources, measurement, and utilization of individual differences. Building upon the general universality of the principles of psychology studied in basic psychology, this course examines the interaction of the physiological, social, cognitive, and situational factors that make each man a unique person. In addition to a more comprehensive study of the areas covered in the basic curriculum, emphasis is placed upon measurement and statistics, testing, adjustments, attitudes, group dynamics, and the physiological basis of behavior. *Prereq: N106.*

N610 PRINCIPLES OF MANAGEMENT. *Three Sem Hrs (3–0).* The essential principles of management are presented around the concept that management is a process applicable in many enterprises, including the military. Included, with military applications, are the topics of case study analysis, human relations, functions of management (planning, organizing, directing, coordinating, and control), supervision, and evaluation. *Prereq: N106.*

N701 FINANCIAL MANAGEMENT. *Three Sem Hrs (3–0).* An introductory course in the basic fundamentals of accounting concepts. Attention is focused on the principles which underlie the construction of financial statements and their use in management control and business decisions. Concludes with a survey of the generation of the federal budget and the federal accounting process. The role of the military executive as a financial manager is emphasized throughout. *Prereq: N610.*

N702 MATERIAL MANAGEMENT. *Three Sem Hrs (3–0).* An introductory course into the various areas of material management. Emphasis is given to concepts of requirements, determination, procurement and contract administration maintenance programs, and inventory control. Study is also made of the organization and the functions of those activities of the Department of Defense in the material management field. The role of the line officer in effective material management is stressed throughout. *Prereq: N610.*

N705 OCEAN WAVES, TIDES, AND ICE. *Three Sem Hrs (3–0).* Study and comparison of classical water wave theory with the modern statistical approach to waves. Relationships between wind and sea-surface phenomena: swell, breakers, internal waves, astronomic tides, tidal currents, seiches, meteorologic tides, and tsunami are examined along with the formation, melting, and movement of ice. *Prereq: N603, N607, S212.*

N707 GAMES OF STRATEGY. *Three Sem Hrs (3–0).* A study of the mathematical structure and significance of game theory with emphasis on the solution of two-person zero-sum games. The minimax theorem and its implications are studied in depth. The simplex method of linear programming is presented as the primary method to solve multiple strategy games. Additional linear programming topics covered are duality, sensitivity analysis, and the transportation problem. Course is taught in the framework of military applications. *Prereq: M309 or M606; M601.*

N708 SYNOPTIC METEOROLOGY. *Three Sem Hrs (3–0).* Particular emphasis is placed on the scientific method of analysis and on prediction of the synoptic features of the atmosphere. Topics include the methods and mathematical basis for meteorological analysis, the mechanisms of long planetary and short atmospheric upper-level waves and their associated surface weather systems, and the weather-typing of cyclones, anticyclones and tropical storms. The course culminates in the generation of forecasts of the normal meteorological parameters through the use of dynamical and statistical methods. These forecasts are used to develop predictions of radio and radar propagation characteristics, radiological fallout patterns, vapor-trail formation, etc. *Prereq: N607, M309.*

N710 DECISION THEORY. *Three Sem Hrs (3–0).* A mathematical study of the decision-making process through the application of probability and descriptive statistics. Emphasis is placed on the quantitative implications of uncertainty. Areas of concentration include Bayes' strategies, hypothesis testing, and utility theory. The techniques of decision theory are applied to naval operational planning and military decision-making. *Prereq: M606.*

N712 AEROSPACE ENVIRONMENT. *Three Sem Hrs (3–0).* Designed to give the student a better understanding of the universe around him as well as his relationship to it, and to develop his interest in interplanetary navigation, space travel, space and solar physics, astrobiology, astrogeology, and the factors making up space medicine. *Prereq: S212.*

N714 WAR GAMING. *Three Sem Hrs (3–0).* An introduction to the use of war gaming, both as a training device and as an analytical technique for the treatment of complex operational problems. The course includes historical development, classification by type and purpose, manual war gaming, computer-assisted war gaming, the scientific method and simulation, the Monte Carlo Method, principles of computer simulation design, and war gaming activities of the Armed Forces. A basic undertaking of the course is the preparation by each student of a research project involving war gaming. Computer programming is not a prerequisite, although there is opportunity for those who are interested to program a computer simulation. *Prereq: M606 or M309.*

N802 ORGANIZATIONAL BEHAVIOR. *Three Sem Hrs (3–0).* An analysis of the social-psychological determinant of effective group behavior. Such factors as group structure, interpersonal relationships, individual behavior in social systems, attitudes and techniques of attitude change, and cohesiveness and effect of deviant behavior on group problem-solving will be studied in detail. *Prereq: N601 or N609.*

N805 MILITARY PSYCHOLOGY. *Three Sem Hrs (3–0).* An introduction to the dynamics of task-oriented groups. Such factors as group structure, interpersonal relationships and leadership style as they relate to organizational effectiveness in the military, formation of attitudes and techniques for attitude change, individual behavior in social systems, group cohesiveness, and effect of deviant behavior on group problem-solving will be studied in detail. *Prereq: N609.*

N806 ADVANCED NAVIGATION. *Three Sem Hrs (3–0).* A study and assessment of the art and science of navigation—past, present, and future. The course includes a survey of the history of navigation, an examination of the special problems of polar and lifeboat navigation, a study of the theory and operation of the most recent electronic, satellite, and inertial navigation systems, and an introduction to space navigation. *Prereq: N313.*

N808 NAVAL STRATEGY AND MILITARY PLANNING. *Three Sem Hrs (3–0).* The interrelationship of naval strategy, national strategy, and national policy to current international situations and commitments. The strategic effect of naval operations, naval force levels, and economic and ecological factors affecting the employment of naval power are investigated. Detailed studies are made of the military planning process, the intelligence process, and national and naval estimates. *Prereq: For 1/C or 2/C only.*

N813 PERSONNEL ADMINISTRATION. *Three Sem Hrs (3–0).* Concerned with the broad areas of personnel management. Recruitment, selection, placement, training, promotion, and evaluation are covered by comparing civilian industrial organizational practices in these areas with military practices. Emphasis is focused on the topics most directly applicable to the military profession. *Prereq: N609, N610.*

N821 NEARSHORE OCEANOGRAPHY. *Three Sem Hrs (3–0).* Examines the oceanographic regime from the continental break to the intertidal zone. A critical look is taken at the forces at work during the transformation of wave energy in shoaling waters. Refraction diagrams are completed by different methods in conjunction with breaker and surf forecasts. Beach and beach sediments, coastlines and shelf areas are discussed with reference to origin, classification, and features along with the associated biomass. Functional beach structures, case studies, and naval applications complete the nearshore topics discussed. *Prereq: N603, N705.*

N822 ADVANCED STUDIES IN MANAGEMENT. *Three Sem Hrs (3–0).* An analysis in depth of actual problems confronting commercial and military organizations in the field of management, with emphasis on the utilization and application of the principles and techniques developed in the basic curriculum. Effort is directed toward identifying the problem, developing alternative courses of action, and determining recommended solutions. *Prereq: N701, N702, N813.*

N823 METHODS OF OPERATIONS ANALYSIS. *Three Sem Hrs (3–0).* A study of concepts, technical terms and tasks of operations analysis. A study is made of the techniques and the typical problem areas of operations analysis. Topics include network theory, PERT, dynamic programming, queueing theory, inventory theory and Markov chains. *Prereq: M601, M606, or M309; N707.*

N824 APPLICATIONS OF OPERATIONS ANALYSIS. *Three Sem Hrs (3–0).* Presentation of a selection of reports from current literature representative of the broad scope of problems treated by operations research techniques. Areas of investigation include military and non-military efforts with detailed study made of the methodologies involved. Seminar is augmented by guest speakers active in the field of operations research and by an introduction to the concepts of cost effectiveness. *Prereq: N823.*

N832 OCEANOGRAPHIC APPLICATIONS. *Four Sem Hrs (3–2).* Application of the sciences of oceanography and meteorology to the many facets of naval planning, operations, and research and development. Topics include weather, surf, waves, ice, optimum ship routing, ASWEPS, and submarine, antisubmarine and amphibious operations. Work aboard an 84-foot oceanographic research vessel, YP–654–OR, and in the Environmental Science Laboratory and Data Center supports classroom lectures. Operations afloat involve surveys utilizing basic and advanced oceanographic instrumentation in data collection and observations. *Prereq: N821.*

N902–903 RESEARCH PROJECT. *Three Sem Hrs (3–0, 3–0).* An independent study and research project under the guidance of a faculty advisor in an area of interest to the student in his major field. If the project is of sufficient magnitude and depth, it may be continued beyond one semester. *Prereq: Approval of the Head of Department.*

Science Department

Head of Department: Captain M. C. Cook; **Executive Officer:** Commander J. J. Thompson; **Senior Professor:** E. J. Cook; **Professors:** R. A. Goodwin, H. H. Baker, Jr., E. R. Pinkston, G. E. Leydorf, J. A. Lee, Jr., J. R. Smithson, J. F. Kelley, Jr., H. F. Maling, Jr., W. M. Smedley, G. D. Gutsche, R. E. Alley, Jr., D. G. Sheets, O. W. Rollins, S. P. Massie, J. R. Wiebush, S. A. Elder; **Commanders/Lieutenant Colonels:** J. N. Morrissey, G. H. Roby, R. W. Reed, J. W. Kuncas, J. D. Shoup (USMC), D. R. Hendrick, J. C. Patrick, W. R. Overdorff, P. B. Friedrichs (USMC); **Associate Professors:** W. D. Pennington, C. A. Fowler, III, M. M. Oldham, R. R. Ressler, J. G. Zimmerman, W. K. Kay, J. H. Klein, L. R. Schweizer, E. D. Hall, D. A. Nordling, H. M. Neustadt, Jr., F. J. Gomba, B. H. Morgan, B. J. Graham, R. R. Corey, Jr., V. Acosta, J. R. Nixon, C. W. Rector, G. P. Calame, W. F. O'Hara, F. L. Miller, S. E. Krikorian, Jr., E. Koubek; **Lieutenant Commanders/Majors:** R. L. Field, J. F. Kropf, F. M. Fleeman, V. G. Nomady, P. S. Blair, K. M. Lassetter, R. W. F. Sirch, M. E. Wright, C. E. Barnett, E. A. Sechrest, E. O. Dailey, R. J. Fesler, J. R. Camper, G. J. Jenkins, Jr., W. F. Hodkins, G. J. Hopkins; **Assistant Professors:** R. L. Johnston, F. J. Eberhardt, D. W. Brill, J. V. Prestia, W. E. Fasnacht, O. L. Jones, S. H. Burns, R. P. Santoro, R. N. Shelby, D. J. Treacy, F. P. Kuhl, Jr., T. S. Lim, R. L. Martin, L. A. Crum, C. S. Schneider; **Lieutenants/Captains:** J. L. Jones (USMC), J. F. Mayhew (USAF), R. O. Meyers, M. D. Duffy, C. R. Thomas, J. W. Mader, E. P. Feist, R. R. Loose, E. L. Beaulieu, T. A. Shepherd, R. H. Rambo, R. C. Baker, D. H. Loescher, E. Dabich, Jr., J. L. Macon, W. P. Kozain, R. C. Bucholz, G. S. Anderson, R. S. Dalzell, T. P. Smith, D. S. McCaffrey, Jr., E. A. DeMeo, J. B. Tabor, L. J. Puckett; **Instructor:** J. F. Hollywood, Jr.; **Lieutenants (j.g.):** F. P. Box, M. G. Deverell, S. T. Howard.

Mission

The mission of the Science Department is to impart basic concepts and theories, together with appropriate applications, of the physical, life, and earth sciences. A study of science fundamentals is pursued throughout the curriculum. While a familiarity with present-day devices is a necessity, even more important is an understanding of the fundamental principles to which past, present, and future devices owe, or will owe, their existence. Midshipmen are given a realization that progress depends upon a mastery of basic truths and that, as naval officers, they are being prepared to direct the development and use not only of the accomplished results of the sciences but of future possibilities.

Excellent laboratory facilities are provided for student course work and research in chemistry, physics, biology, and electrical and electronics engineering. Most courses require midshipmen to participate in a minimum of two hours of laboratory work each week. Classroom instruction is also supplemented by periodic demonstration lectures and testing. In addition to the seven core courses required of all midshipmen, the department offers 74 electives.

Science

Facilities

The Science Department moved into its beautiful new science building, Michelson Hall, during the summer of 1968. On the first and second floors are 50 classrooms with a total of 1400 seats for basic groups of 18, 24, 32, and 40 students. Each classroom embodies the latest features in classroom design and provides a TV monitor, a remote terminal outlet for computer operations, and facilities and utilities for classroom demonstrations and for the use of all types of audio and visual teaching aids. A combination demonstration table and sink, equipped with water, gas, and variable voltage d-c electrical services, is installed in each chemistry and physics classroom. Five lecture rooms, all specially designed and equipped for science demonstrations, are also available. The two smallest lecture rooms have a seating capacity of 82, and the others seat 150, 200, and 430 persons. Each of these rooms is equipped with arrays of TV monitors, TV camera outlets, provisions for front and rear audio-visual projection, and a full range of water, gas, compressed air, and a-c and d-c electrical services. Nearly 100 laboratories and supporting shops occupy the ground floor. One and two-man offices for the entire 115-man Science Department faculty, as well as conference rooms and separate administrative areas for each of the three disciplines within the department, are located on the third floor of Michelson Hall.

CHEMISTRY. Eight laboratories, arranged in pairs, with a balance room for each pair, are provided for general chemistry instruction. Each laboratory has 20 work stations, and each balance room is equipped with single-pan balances, top-loading balances, student model pH meters, visible-range spectrophotometers, and a high-temperature oven. Laboratories are serviced from a large central stock and preparation room. Each work space has cold water, gas, 110-volt a-c power, and variable a-c power available. Hot and distilled water are available in each room.

Two organic chemistry laboratories (each with 16 work spaces and 32 student storage facilities), one analytical chemistry laboratory (16 work spaces and 32 student storage facilities), one physical chemistry laboratory, and one radiochemistry laboratory are available. Except for the radiochemistry laboratory, preparation rooms adjoin each of the laboratories. Services available in each laboratory include a-c power, variable d-c power, air, gas, vacuum, steam, cold water, hot water, and distilled water.

The biology laboratory accommodates 24 students and is adjoined by a preparation room. There are seven research laboratories. Services are similar to those available in the organic chemistry laboratories.

There are four instrument rooms for the use of students in organic, analytical, and physical chemistry and for the support of student and faculty research. The following special instruments are available for chemistry laboratory work and research: spectrophotometers (IR, visible, and UV), electrobalance (microbalance), recording polarograph, polaratron, flame photometers (filter and grating types), atomic-absorption instrument (digital concentration readout), X-ray emission/diffraction instrument, high-resolution NMR, gas chromotographs (thermal conductivity and flame-ionization detectors), analyzers (carbon, hydrogen, and nitrogen), recording pH stat, amperometric titrator, conductometric-titration apparatus, mass spectrometer, constant-temperature baths (some refrigerated), research model pH meter, micro-calorimeter, and ovens and similar service equipment.

PHYSICS. Seven laboratories, each with eight 2-student work stations, are available for general physics teaching. Additional specialized laboratories provide for teaching and research in thermal physics, physical mechanics, atomic and nuclear physics, acoustics, and optics. Separate research rooms are available for faculty research and for Trident Scholars. A laboratory with multiple independent student research stations provides additional flexibility. Experimental research is conducted in microwave diffraction, atomic excitation, laser development and application, charge compensation effects of rare-earth ions, photonuclear activation of fluorine, flow noise studies, motion of liquid droplets in a sound field, and infrasound generation. Theoretical research is conducted in acoustics, nuclear physics, and solid state physics.

Facilities for acoustics teaching and research include an anechoic chamber, a PDP8/I computer equipped with high speed analog-to-digital converter, a sound-spectrum analyzer, a precision instrumentation recorder, an assortment of instruments for signal generation and amplification, and sound generating equipment covering the range from infrasonic to ultrasonic frequencies. The optics laboratory provides a variety of helium-neon lasers of different power outputs for teaching and research purposes. A carbon dioxide laser has recently been constructed in-house and is now in use for research. Conventional apparatus such as spectrometers and interferometers are also available.

The atomic and nuclear physics laboratory is equipped for experiments in atomic spectra, photoelectric effect, electron diffraction, X-ray diffraction, Mossbauer effect, Zeeman effect, nuclear-magnetic resonance, and beta-ray spectroscopy. Geiger, proportional, scintillation, and solid state counters are provided for nuclear particle detection, together with single and multichannel analyzers for coincidence and correlation studies. The solid-state laboratory has a two-meter

Czerny-Turner vacuum spectrograph, a 12-inch Varian magnet, and electron paramagnetic resonance apparatus.

Physics support facilities include a precision machine shop, two darkrooms, and an instrument development and repair shop. For experimental teaching by multimedia methods, a 20-station classroom is under development. This classroom will permit instruction by various media, including slides and television tapes, and will provide for computer analysis of student response for feed-back to the instructor.

ELECTRICAL SCIENCE. Electrical science laboratories employ a unique concept involving a central distribution center and custom-designed students' work tables. Voltage signals of varied frequency and waveform are produced in an extensive array of electronic generators located in the distribution center. These signals are selectively relayed through coaxial cables to all of the laboratories and to each of the 175 two-man student work tables. Cable runs make this wide selection of waveforms available in lecture rooms, classrooms, computer facilities, and selected laboratories of other Science Department disciplines. Primary electrical power (60 Hz a-c, 400 Hz a-c, and d-c) is distributed from the central distribution center through appropriate switching and protective facilities.

Each laboratory table provides a large work area facing a metal housing accommodating eight standard 19-inch panels. Electrical services are supplied to the table through two of these panels. One provides safe and convenient access to primary power, and the other is used for voltage signals of varied frequency and waveform. The second panel also contains provisions for impedance transformation and amplitude adjustment. The remaining panels make instruments and other support facilities available. The array of panels installed at a particular work table is dictated by the nature of the experiment and the academic level of the student. Typical instrumentation available in panel-mounted form includes multimeters, vacuum tube voltmeters, power supplies, bridge and potentiometer circuits, utility primary power panels, digital circuit breadboards, etc. Additional panels are designed and fabricated as technological requirements dictate. Experimental work is carried out on experimental circuit boards which facilitate rapid connection and permutation of circuits and convenient measurement of quantities of interest.

The laboratory table provides discipline-oriented facilities for a two-man student team. A binaural audio link that supplies two pairs of binaural headphones with magnetic tape programs is at each table. These programs can be synchronized to slides or other teaching aid material if desired. Tape and synchronization facilities are components of the central distribution system.

CORE COURSES

S101	General Chemistry I
S102	General Chemistry II
S211	General Physics I
S212	General Physics II
S206	Modern Physics
S305	Introduction to Electrical Science
S306	Applications of Electrical Science

MINORS PROGRAM

Applied Science

Core substitutions as follows:

S213	Introductory Physics I (in lieu of S211)
S214	Introductory Physics II (in lieu of S212)
S620	Electrical Circuit Principles (in lieu of S305)
S740	Introduction to Active Circuits (in lieu of S306

Plus:

S701	Atomic Physics
S702	Nuclear Physics
S741	Electronics
M751	Engineering Math I
M752	Engineering Math II

Plus one of the following:

E614	Engineering Materials
E708	Heat Transfer

Electrical Science

Core substitutions as follows:

S213	Introductory Physics I (in lieu of S211)
S214	Introductory Physics II (in lieu of S212)
S620	Electrical Circuit Principles (in lieu of S305)
S740	Introduction to Active Circuits (in lieu of S306)
W332	Systems Engineering Analysis I—Linear Systems (in lieu of W411)

Plus:

S741	Electronics
S821	Electromagnetic Theory
S842	Electrical Properties of Materials
S843	Switching Circuits
S840	Network Analysis

Plus one of the following:

S701, S704, S710, S841, S844, S850, S851, M601, M606, M704, M721, M751, W931

Chemistry

S605	Organic Chemistry I
S606	Organic Chemistry II
S713	Inorganic Chemistry I
S714	Analytical Chemistry I
S811	Physical Chemistry I
S812	Physical Chemistry II

Physics

Core substitutions as follows:

S213	Introductory Physics I (in lieu of S211)
S214	Introductory Physics II (in lieu of S212)

Plus:

S701	Atomic Physics
S722	Physical Mechanics
S821	Electromagnetic Theory

Plus two of the following:

S702	Nuclear Physics
S704	Acoustics
S822	Optics
S830	Physics of Solids
S832	Statistical Physics

Plus one of the following:

S721	Thermal Physics
S733	Physical Chemistry I (without lab)
S811	Physical Chemistry I (with lab)

MAJORS PROGRAM

Applied Science

Core substitutions as follows:

S213	Introductory Physics I (in lieu of S211)
S214	Introductory Physics II (in lieu of S212)
S620	Electrical Circuit Principles (in lieu of S305)
S740	Introduction to Active Circuits (in lieu of S306)
W332	Linear Systems Analysis (in lieu of W411)

Plus:

S701	Atomic Physics
S702	Nuclear Physics
S741	Electronics
M751	Engineering Math I
M752	Engineering Math II
S733	Physical Chemistry I

Plus two of the following:

E701, M606, S704, S821, S822, S710, S830, S840, S841, S842, S843, S844, S850, S734, S832, W931, W932

Plus one of the following:

E614	Engineering Materials
E708	Heat Transfer

Electrical Science

Core substitutions as follows:

S213	Introductory Physics I (in lieu of S211)
S214	Introductory Physics II (in lieu of S212)
S620	Electrical Circuit Principles (in lieu of S305)
S740	Introduction to Active Circuits (in lieu of S306)
W332	Linear Systems Analysis (in lieu of W411)

Plus:

S741	Electronics
S821	Electromagnetic Theory
S840	Network Analysis
S842	Electrical Properties of Materials
S843	Switching Circuits
S710	Electromagnetic Waves

Plus three of the following:

S701, S704, S705, S841, S844, S850, S851, S852, M601, M606, M704, M721, M722, M751, M752, M802, M825, M826, M852, M861, W931, W932, W934

Chemistry

S605	Organic Chemistry I
S606	Organic Chemistry II
S713	Inorganic Chemistry I
S714	Analytical Chemistry
S733	Physical Chemistry I
S813	Physical Chemistry II
S813	Qualitative Organic Analysis

S814	Quantitative Analysis II
S815	Inorganic Chemistry II

Plus one of the following

S816	Biochemistry
S818	Reaction Kinetics
S820	Electrochemistry

Physics

Core substitutions as follows:

S213	Introductory Physics I (in lieu of S211)
S214	Introductory Physics II (in lieu of S212)

Plus:

S701	Atomic Physics
S722	Physical Mechanics
S723	Lab Physics I*
S724	Lab Physics II*
S821	Electromagnetic Theory
S823	Lab Physics III*
S824	Lab Physics IV*
S825	Physics Seminar I
S826	Physics Seminar II

Plus two of the following:

S702, S704, S822, S830, S832

Plus one of the following:

S721, S733, S811

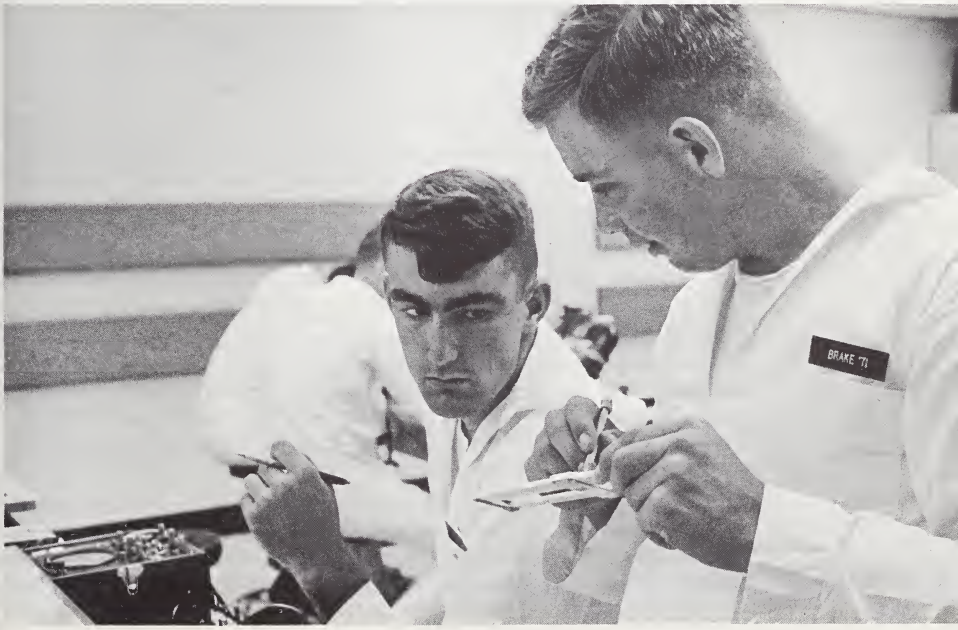
Plus one of the following:

M721, M751

Plus one of the following:

M722, M751, M825

**Required for the Class of 1970 only. For the Class of 1971 and subsequent, laboratory work will be incorporated in S701, S702, S704, S721, S722, and S822.*



Course Descriptions

Chemistry

S101 & S102 GENERAL CHEMISTRY I AND II. *Four Sem Hrs Each Term (3–2, 3–2)*. Fundamentals of chemical theory, with a study of the properties of metals and nonmetals. Among topics studied in chemical theory are the laws of chemical change, atomic structure and the periodic table, kinetic-molecular theory and the gas laws, solutions, chemical equilibrium, ionization, electrochemistry, radioactivity, nuclear reactions, and nuclear energy from fission and fusion reactions. Metals studied include the alkali and alkaline earth metals, aluminum, and iron. Nonmetals studied are limited to oxygen, hydrogen, halogens, nitrogen, and sulfur families, carbon, and simple carbon compounds. Practical naval applications covered include batteries, corrosion, water treatment, explosives, chemical warfare, the atomic bomb, the hydrogen bomb, and nuclear power plants for propulsion. Laboratory work includes both descriptive and quantitative experiments, and a brief introduction to the principles of semimicro qualitative analysis applied to a few of the more common cations.

S105 & S106 ADVANCED GENERAL CHEMISTRY I AND II. *Four Sem Hrs Each Term (3–2, 3–2)*. Designed primarily for the advanced student. All the important fundamental concepts of chemistry are discussed but from a much more penetrating point of view. Topics included are elementary thermodynamics, reaction rates, and chemical bond theory.

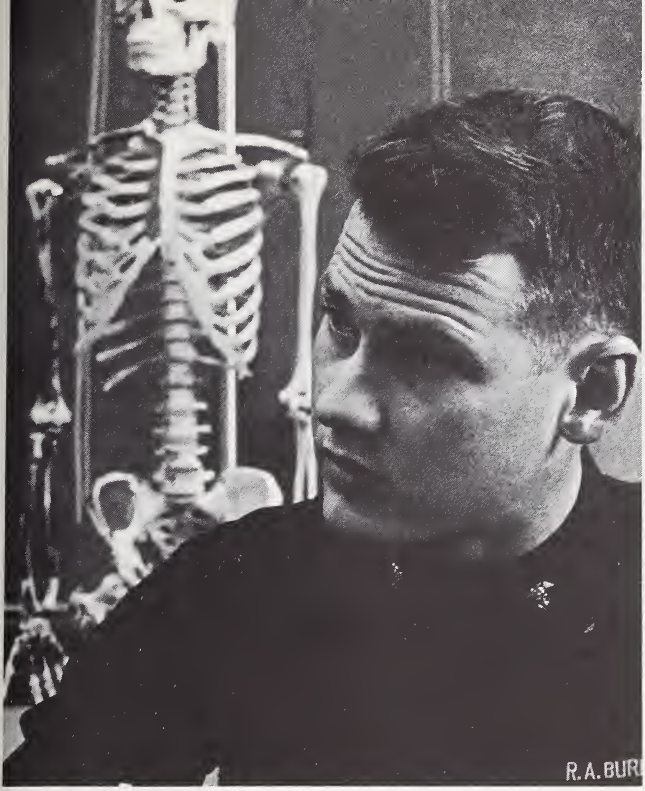
Science

S107 GENERAL CHEMISTRY (SPECIAL). *Three Sem Hrs (3–0)*. The important basic principles of chemistry are discussed at a significantly more rapid pace (at a rate of about $2\frac{1}{2}$ to 1) than in S101 & S102. Special topics emphasized include practical naval applications such as batteries, corrosion, water treatment, explosives, nerve-gas chemistry, fission and fusion weapons, and nuclear power plants. Expanded coverage is given to organic chemistry. Admission to this course is limited to midshipmen who provide evidence of a sound background in chemistry (either college or high-school) but do not validate S101 and S102, and will be authorized only with the specific approval of the Academic Dean. Completion of S107 satisfies the core course requirements of both semesters of S101 & S102.

S605 & S606 ORGANIC CHEMISTRY. *Five Sem Hrs Each Term (3–6, 3–6)*. A study of the principles of organic chemistry, including the fundamental concepts of energy relationships, resonance, dipole moments, ionic character in covalent bonds and relative electronegativities of atoms and radicals, and the newer areas of organic chemistry, including, for example, high-energy fuels, synthetic motor fuels, explosives, synthetic rubber and high polymers, detergents, and "wonder" drugs. *Prereq: S102, S106, or S107.*

S609 & S610 GENERAL BIOLOGY I AND II. *Four Sem Hrs Each Term (3–2, 3–2)*. A study of the fundamental principles of the various fields of biology, beginning with the characteristics and behavior of protoplasm and cells; general plant and animal histology; plant and animal metabolism; cell gametogenesis and cell division. The principles of genetics and eugenics; ecology; organic evolution. *Prereq: S102, S106, or S107.*

S611 PHYSICAL GEOLOGY. *Three Sem Hrs (3–0)*. A study of the science of the solid earth, including the nature and properties of the minerals and rocks composing the earth, their distribution, the processes by which they are formed, altered, transported, and distorted, and the nature and development of the landscape. *Prereq: S101, S105, or S107.*



S612 HISTORICAL GEOLOGY. *Three Sem Hrs (3–0).* A study of the physical history of the earth and the record of life on the earth. Emphasis on the development of the North American Continent. *Prereq: S101, S105, or S107 (S611 desirable but not required).*

S713 INORGANIC CHEMISTRY I. *Three Sem Hrs (3–0).* A study of fundamental concepts of inorganic chemistry. Topics covered include atomic structure, chemical bonding, complex ions and coordination chemistry, and special topics, including organometallics and rare gas compounds. *Prereq: S102, S106, or S107.*

S714 ANALYTICAL CHEMISTRY I. *Four Sem Hrs (2–6).* A study of volumetric, gravimetric, and modern optical and electrical methods of analyses. Theory, laboratory procedures, and techniques are stressed. *Prereq: S102, S106, or S107.*

S733 & S734 PHYSICAL CHEMISTRY I and II. (Without Lab.) *Three Sem Hrs Each Term (3–0, 3–0).* An introduction to such topics as physical states of matter, kinetic theory of gases and liquids, the first and second laws of thermodynamics, free energy and spontaneity of chemical reactions, phase equilibrium, properties of solutions, chemical kinetics, electrochemistry, elementary quantum theory, and atomic and molecular structure. *Prereq: S102, S106, or S107; S212 or S214; M220.*

S811 & S812 PHYSICAL CHEMISTRY I AND II. (With Lab.) *Four Sem Hrs. First Term (3–3); Five Sem Hrs Second Term (3–6).* An introduction to such topics as physical states of matter, kinetic theory of gases and liquids, the first and second laws of thermodynamics, free energy and spontaneity of chemical reactions, phase equilibrium, properties of solutions, chemical kinetics, electrochemistry, elementary quantum theory, and atomic and molecular structure. *Prereq: S102, S106, S107; S212* or *S214; M220.*

S813 ORGANIC CHEMISTRY III. *Four Sem Hrs (2–6).* Synthetic methods and discussion of important theories of organic chemistry—a continuation of S605–606. Methods of qualitative organic analysis are also covered. The laboratory work emphasizes systematic methods for separation and identification of organic compounds. *Prereq: S606, S814.*

S814 ANALYTICAL CHEMISTRY II. *Four Sem Hrs (2–6).* A continuation of S714. The theory and applications of modern instrumental methods of analysis are stressed. *Prereq: S714, S812.*

S815 INORGANIC CHEMISTRY II. *Three Sem Hrs (3–0).* Continuation of S713. The following topics are considered: solute-solvent effects, acid-base theories, nonaqueous solvents, crystal structure, kinetics and mechanisms, and special topics, including carbonyl compounds, boron hydrides, isopoly and heteropolymolybdates and tungstates, and items of interest from recent chemical literature. *Prereq: S713.*

S816 BIOCHEMISTRY. *Three Sem Hrs (3–0).* An introductory course in human biological chemistry which includes a detailed study of the chemistry of proteins, carbohydrates, and fats, tissue, enzymes, digestion, physiological oxidations, energy metabolism (both normal and abnormal) respiration and acid-base balance water and trace mineral paths. The physiological role of vitamins and hormones is considered, and chemical analysis of blood, milk and urine are included. Modern radioisotope techniques are discussed. *Prereq: S102, S106, or S107; S605.*

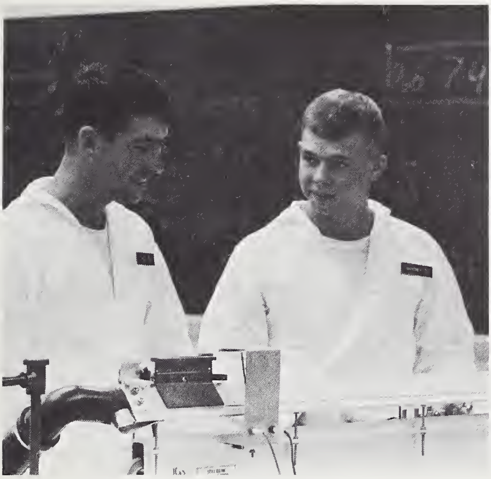
S818 REACTION KINETICS. *Three Sem Hrs (3–0).* An examination of the physical and mathematical bases of reaction-rate studies. The mechanisms and statistical mechanics of reactive collisions and the kinetics and mechanisms of chemical reactions are covered. Special emphasis is given to solution and adsorption phenomena, with particular attention to the kinetics of homogeneous and heterogeneous catalysis. *Prereq: S812.*

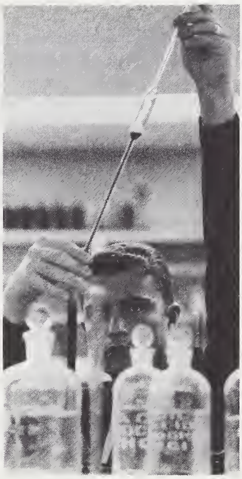
S820 ELECTROCHEMISTRY. *Three Sem Hrs (3–0).* A study of electrolytic conductance, ion migration, electrode potentials, the deposition and corrosion of metals, and electrokinetic phenomena in terms of the physiochemical properties of electrolyte systems. *Prereq: S812.*

S902C & S903C SCIENCE RESEARCH PROJECT. *Three Sem Hrs Each Term (0–6, 0–6).* A creative scientific research project in the student's field of interest. A faculty adviser must approve and monitor each project. At least one conference and a minimum of six hours of laboratory work are required each week. If the project is of sufficient magnitude and depth, it may be continued for a second semester. *Prereq: Approval of the Head of Department.*

S904C & S905C SCIENCE SPECIAL LABORATORY PROJECT. *Two Sem Hrs Each Term (0–4, 0–4).* A creative scientific laboratory project of limited scope in the student's field of interest. A faculty adviser must approve and monitor each project. A conference and a minimum of four hours of laboratory work are required each week. Individuals pursuing a major research project should enroll in S902C/S903C. *Prereq: Approval of the Head of Department.*

S906C & S907C SCIENCE SPECIAL LABORATORY PROJECT. *One Sem Hr Each Term (0–2, 0–2).* Same as S904C/C905C except that a minimum of two hours of laboratory work is required each week.





Physics

S206 MODERN PHYSICS. *Three Sem Hrs (3–0).* A survey of the significant discoveries and developments which have marked the progress of physics during the first half of the 20th century. Some of the topics considered are the Rutherford-Bohr atom; quantum and relativistic effects; the structure of many-electron atoms; particle ranges, absorption, and detection; radioactivity; the neutron, nuclear forces, and nuclear reactions. *Prereq: S212* or *S214.*

S211 & S212 GENERAL PHYSICS I AND II. *Four Sem Hrs Each Sem (3–2, 3–2).* Emphasis in these two sequential courses is placed on the fundamental principles of classical physics, however, contemporary applications of these principles are introduced as appropriate. The topics covered are mechanics, electricity, magnetism, kinetic theory, wave motion, sound, and light. The calculus and vectors are used throughout the course. *Prereq: S102, S106, or S107 is required for S211; S211 for S212.*

S213 & S214 INTRODUCTORY PHYSICS I AND II. *Four Sem Hrs Each Sem (3–2, 3–2). Offered First Semester Only.* An in-depth study of general physics designed to provide a strong foundation for midshipmen who have elected to minor in Physics, Applied Science, or Electrical Science, for whom it is required as a substitute for core courses S211 and S212. Also offered as an enriched course for selected midshipmen whose primary interest is directed toward other disciplines. The scope, but not the ordering of material, is that of the traditional general physics course and includes the study of mechanics, heat, sound, electricity, and light. The calculus and vectors are employed throughout. *Prereq: S102, S106, or S107; M111; Permission of Head of Science Department for midshipmen not minoring in Physics, Applied Science, or Electrical Science.*

S608 DEVELOPMENT OF PHYSICAL THEORY. *Three Sem Hrs (3–0).* Primarily a nonmathematical survey of the evolution of some basic physical concepts. Considerable use is made of library references, and emphasis is placed upon historical development, influence of philosophy, and considerations of alternate formulations. The whole range of physics will not be covered, but rather a few ideas will be studied in some detail. Examples are the conservation of energy, electric charge, temperature and heat, and formulation of the laws of motion.

S701 ATOMIC PHYSICS. *Three Sem Hrs (3–0).* An introduction to quantum mechanics and its application to atomic phenomena. The basic postulates of quantum mechanics are presented and related to physical measurements. The theory is used to solve the problems of barrier potentials, square wells, the simple harmonic oscillator, angular momentum, and the Coulomb field. The solutions are applied to problems which include the band theory of solids, black body radiation, specific heats, electron spin, the periodic table, atomic and molecular spectra, and X-rays. (This course will be augmented with a weekly 2-hour laboratory period during the second semester of this academic year.) *Prereq: S206; M224, M226, or M228.*

S702 NUCLEAR PHYSICS. *Three Sem Hrs (3–0).* A study of the basic experimental facts of purely nuclear origin, and their interpretation in terms of quantum theory. Included are basic nuclear properties, radioactive decay, nuclear reactions, interaction of radiation with matter, nuclear instrumentation, quantum theory of scattering, nuclear forces, nuclear models and structure, and neutron physics. (This course will be augmented with a weekly 2-hour laboratory period in Academic Year 1970–1971.) *Prereq: S701.*

S704 ACOUSTICS. *Three Sem Hrs (3–0).* A study of the fundamental principles of acoustics with emphasis on numerical methods of analysis. Dartmouth BASIC computer programming instruction is integrated into the course. Topics include oscillations, plane and spherical waves, radiation patterns, reflection coefficients, attenuation, velocity, ray theory, scattering, reverberation, fluctuations, echo-ranging, and noise. (This course will be augmented with a weekly 2-hour laboratory period in Academic Year 1970–1971.) *Prereq: S212 or S214.*

S705 SONAR. *Three Sem Hrs (3–0).* A fundamental study of sound propagation in the ocean environment as it relates to the design and operation of sonar. The elements of the sonar equations such as transmission loss, directivity index, etc. Sources of noise and methods of measurement. Long-range sound propagation. *Prereq: S704.*

S721 THERMAL PHYSICS. *Four Sem Hrs (3–2).* The first part of this course develops the theoretical structure of thermodynamics with applications to physical problems. The second part introduces the kinetic theory of gases and classical statistical mechanics. The laboratory provides an opportunity for students to use various techniques for measurement of such thermal properties as temperature and specific heat. *Prereq: S212 or S214.*

S722 PHYSICAL MECHANICS. *Four Sem Hrs (3–2).* A course in physical mechanics at the intermediate level that is intended to provide a basis for further study in either classical or quantum physics. Topics studied include mechanical oscillations, planetary motion, rigid bodies, and Lagrangian and Hamiltonian mechanics. *Prereq: S212 or S214.*

S723 LABORATORY PHYSICS I. *One Sem Hr (0–2).* Laboratory work in this course is devoted to physical measurement techniques and the performance of experiments closely related to the theory being developed in concurrent physics courses. *Prereq: S212 or S214.*

S724 LABORATORY PHYSICS II. *One Sem Hr (0–2).* Laboratory work in this course is devoted to physical measurement techniques and the performance of experiments closely related to the theory being developed in concurrent physics courses. *Prereq: S723.*

S821 ELECTROMAGNETIC THEORY. *Three Sem Hrs (3–0).* A course in the basic principles of electric and magnetic fields as expressed in vector form. Electrostatic problems are considered first, using Laplace's and Poisson's equations. The vector potential and the displacement current are introduced, and Maxwell's equations are formulated. *Prereq: S212 or S214; M224.*

S822 OPTICS. *Three Sem Hrs (3–0).* An introduction to modern optics including the use of the Fourier transform in the study of diffraction, the concepts of partial coherence, interference theory, holography, polarized light, and the optics of solids. (This course will be augmented with a weekly 2-hour laboratory period in Academic Year 1970–1971.) *Prereq: S821.*

S823 LABORATORY PHYSICS III. *One Sem Hr (0–2).* Laboratory work in this course is devoted to physical measurement techniques and the performance of experiments closely related to the theory being developed in concurrent physics courses. *Prereq: S212* or *S214.*

S824 LABORATORY PHYSICS IV. *One Sem Hr (0–2).* Laboratory work in this course is devoted to physical measurement techniques and the performance of experiments closely related to the theory being developed in concurrent physics courses. *Prereq: S212* or *S214.*

S825 PHYSICS SEMINAR I. *One Sem Hr (1–0).* A seminar with topics selected from modern physics. *Prereq: S722.*

S826 PHYSICS SEMINAR II. *One Sem Hr (1–0).* A seminar with topics selected from modern physics. *Prereq: S825.*

S830 PHYSICS OF SOLIDS. *Three Sem Hrs (3–0).* An introductory course in physics of the solid state. The topics included are crystal structures, thermal properties of solids, dielectric properties of solids, free electron model of metals, band theory of solids, magnetism and magnetic resonance, and semiconductors. *Prereq: S701.*

S832 STATISTICAL PHYSICS I. *Three Sem Hrs (3–0).* Presents the elements of classical and quantum statistical physics and prepares the student for an advanced treatment of the subject. Emphasis is placed on ensemble theory, and the theoretical structure is developed utilizing modern concepts and notation. The course begins with a review of thermodynamics, developing the Carathéodory axiomatic formulation in some detail. Pertinent aspects of probability theory are presented, the concepts of phase space, μ-space, γ-space, and ensembles are introduced, and Liouville's theorem proved. A discussion follows of statistical equilibrium and the uniform microcanonical, canonical, and grand canonical ensembles. The ergodic problem is treated briefly. The quantum statistical density matrix is developed in detail, and its use in quantum ensemble theory explicated. The Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics are developed and compared. Classical and quantum partition functions are obtained from the various ensembles—the grand canonical ensemble being particularly emphasized. The important thermodynamic functions are then expressed in terms of the partition function. The remainder of the course is devoted to selected applications. *Prereq: S721* or *S733; S701.*

S902P & S903P SCIENCE RESEARCH PROJECT. *Three Sem Hrs Each Term (0–6, 0–6).* A creative scientific research project in the student's field of interest. A faculty adviser must approve and monitor each project. At least one conference and a minimum of six hours of laboratory work are required each week. If the project is of sufficient magnitude and depth, it may be continued for a second semester. *Prereq: Approval of the Head of Department.*

S904P & S905P SCIENCE SPECIAL LABORATORY PROJECT. *Two Sem Hrs Each Term (0–4, 0–4).* A creative scientific laboratory project of limited scope in the student's field of interest. A faculty adviser must approve and monitor each project. A conference and a minimum of four hours of laboratory work are required each week. Individuals pursuing a major research project should enroll in S902P/S903P. *Prereq: Approval of Head of Department.*

S906P & S907P SCIENCE SPECIAL LABORATORY PROJECT. *One Sem Hr Each Term (0–2, 0–2).* Same as S904P/S905P except that a minimum of two hours of laboratory work is required each week.

Electrical Science

S305 & S306 INTRODUCTION TO ELECTRICAL SCIENCE AND APPLICATIONS OF ELECTRICAL SCIENCE. *Four Sem Hrs Each Sem (3–2, 3–2).* Fundamental electrical principles, circuit analysis techniques, principles of electromechanical energy conversion and the elements of electronics. Transient and steady-state conditions in electric circuits; d-c and a-c machinery; vacuum and solid-state devices in amplifiers, oscillators, modulators, receivers, and logic circuits. Fundamentals of electrical measurement and data interpretation are stressed in the weekly two-hour laboratory; emphasis is placed on the cathode-ray oscilloscope as a data-display device. *Prereq: S211 or S213, M215 or M221.*

S403 NAVAL ELECTRONICS SYSTEMS I. *Three Sem Hrs (3–0).* Naval applications of electronics with emphasis on radar, sonar, and related systems. The radar range equation and the fundamental techniques of range and bearing determination. Properties of transmission lines and other circuits with distributed constants. Antenna directivity characteristics and techniques for steering radiating arrays. Design considerations in transmitters, receivers, and associated data processing and display systems. Limitations imposed on system performance by noise, sea or ground clutter, and atmospherics. Laser, infra-red, and sonar systems are considered through comparison with conventional radar devices. *Prereq: S741.*

S404 NAVAL ELECTRONIC SYSTEMS II. *Three Sem Hrs (3–0).* Naval applications of electronics to instrumentation and data acquisition and processing. Fundamental transducers for determination of non-electrical quantities such as pressure, temperature, velocity, and acceleration. Conversion of analog quantities into digital representation. The techniques of counting and encoding to produce digital output for processing and display. *Prereq: S741.*

S620 ELECTRIC CIRCUIT PRINCIPLES. *Four Sem Hrs (3–2).* Time-domain analysis of R-L-C circuits; energy relationships, natural and forced response to a variety of non-sinusoidal driving functions; derivation and use of phasor and impedance concepts. Steady-state response of lumped-constant circuits. Magnetic circuits and the ideal transformer. Maximum power, superposition, Thevenin and Norton theorems. Pole-zero characteristics and the interpretation of pole-zero constellations. Fundamental measurement skills, with emphasis on the cathode-ray oscilloscope, are stressed in weekly laboratory exercise. *Prereq: S211 or S213; Coreq: M224 or M228.*

S710 ELECTROMAGNETIC WAVES. *Three Sem Hrs (3–0).* Proceeds from a study of electric and magnetic fields, in which vector analysis is employed, to a consideration of Maxwell's equations and the radiation of electromagnetic waves. Boundary conditions and the propagation phenomena of reflection, refraction, interference, and diffraction are treated in some detail, and wave guides, transmission lines, and radiating systems are introduced. *Prereq: S821, M224.*

S740 INTRODUCTION TO ACTIVE CIRCUITS. *Four Sem Hrs (3–2).* Principles of electro-mechanical energy conversion. Polyphase systems, rotating magnetic fields, synchronous speed, slip. Fundamentals of motor and generator action. Development and use of mathematical models of typical machines. Conduction processes in semiconductor materials. The semi-conductor diode and the transistor. Volt-ampere characteristics of electron devices; graphical analysis. Temperature effects in semiconductors and bias stabilization. Models and equivalent circuits of electronics devices. Amplifier fundamentals, terminal characteristics of amplifiers, frequency response, impedance compatibility. Small-signal equivalent circuits; the decibel and other logarithmic systems. *Prereq: S620.*

S741 ELECTRONICS. *Four Sem Hrs (3–2).* Untuned and tuned power amplifiers, distortion analysis, feedback, effects of feedback on amplifier terminal characteristics. Principles of modulation (AM, FM, PCM) and demodulation. Frequency multiplication, translation and synthesis. The superheterodyne radio receiver and beat-frequency oscillator. Noise and bandwidth considerations in communications systems. Electronic devices in the switching mode; elements of pulse and digital circuits. *Prereq: S740.*

S840 NETWORK ANALYSIS. *Three Sem Hrs (3–0).* The development of mathematical models to represent electrical and mechanical networks. The equilibrium equations, their solution and interpretation. Response of networks to exponential and step-forcing functions; the impulse response and its use in analysis. The particular integral and the steady-state response. Definition of the system function and its use in the determination and interpretation of response. Fundamental network theorems in terms of system functions. Elements of system synthesis. *Pre- or Coreq: S740.*

S841 ENERGY CONVERSION. *Four Sem Hrs (3–2).* Energy storage in singly and multiply excited systems. Magnetic materials and circuits; hysteresis and eddy current effects. The state-function concept. Graphical analysis of singly excited systems. Energy balance equations for constant current, for variable current, for constant-flux linkage, and during arbitrary transition. Application of the basic force equations. Analytic study of singly excited systems. Linear electromagnetic systems. Singly and multiply excited reluctance torque machines. Dynamic analysis of electro-mechanical transducers. Statement and formulation of problems for computer solution. Analytical study of the idealized uniform air gap rotating machine based on the winding inductances. Study of electromechanical devices based on energy-balance equations, the basic force equations, and the winding inductances. Methods of electrical energy generation, including electromechanical, magneto-hydrodynamic, and the fuel cell. Laboratory investigation of a generalized machine in various modes of operation. *Prereq: S740.*

S842 ELECTRONIC PROPERTIES OF MATERIALS. *Three Sem Hrs (3–0).* Limitation of classical treatment of conduction properties. Introduction to quantum theory. Statistics, Fermi-Dirac systems. Band theory and electronic conduction. Semiconductors. Semiconductor junctions and devices. A brief discussion of dielectrics and magnetics. *Prereq: S206.*

S843 SWITCHING CIRCUITS. *Four Sem Hrs (3–2).* Design and application of representative devices and circuits used in digital electronic systems. Basic design techniques for semiconductor switching circuits. Introduction to logic concepts and terminology; use of these concepts in the study of complex switching circuits and their use in representative systems. Operation of logic and switching units as registers, adders, multipliers, and other functional elements in typical digital systems. *Prereq: S741* or *S306.*

S844 ELECTRONIC INSTRUMENTS AND MEASUREMENT. *Four Sem Hrs (2–4).* Analysis and design of electronic circuits of control, measurement, data transmission and processing. Instrument calibration and response. Comparison of methods for measurement and control of voltage, resistance, impedance, and frequency, to include error analysis. Topics included are electronic voltmeters, DC amplifier, pulse-shaping and switching circuits, function generators, oscillators and time-base generators, counting and time-interval measuring circuits, frequency-control, and measurement circuits. *Prereq: S740.*

S850 DIGITAL APPLICATIONS. *Four Sem Hrs (2–4).* The study and analysis of an automated digital-data system, including computer, processing devices, and data communication subsystem. *Prereq: S843.*

S851 COMMUNICATIONS THEORY I. *Three Sem Hrs (3–0).* Mathematics of signals; time and frequency domain characterization of signals; transmission of signals through linear systems; bandwidth. Principles of modulation and detection; AM, FM, PM transmission line. *Prereq: S741.*

S852 COMMUNICATIONS THEORY II. *Three Sem Hrs (3–0).* Statistical analysis of noise and other random processes. Sampling and quantization of data. Elements of information theory. Digital communication processes. *Prereq: S851.*

Science

S902E & S903E SCIENCE RESEARCH PROJECT. *Three Sem Hrs Each Term (0–6, 0–6).* A creative scientific research project in the student's field of interest. A faculty adviser must approve and monitor each project. At least one conference and a minimum of six hours of laboratory work are required each week. If the project is of sufficient magnitude and depth, it may be continued for a second semester. *Prereq: Approval of the Head of Department.*

S904E & S905E SCIENCE SPECIAL LABORATORY PROJECT. *Two Sem Hrs Each Term (0–4, 0–4).* A creative scientific laboratory project of limited scope in the student's field of interest. A faculty advisor must approve and monitor each project. A conference and a minimum of four hours of laboratory work are required each week. Individuals pursuing a major research project should enroll in S902E/S903E. *Prereq: Approval of Head of Department.*

S906E & S907E SCIENCE SPECIAL LABORATORY PROJECT. *One Sem Hr Each Term (0–2, 0–2).* Same as S904E/S905E except that a mimimum of two hours of laboratory work is required each week.

MICHELSON HALL

Weapons Department

Head of Department: Captain W. K. Doty; **Executive Officer:** Commander G. C. Sup; **Senior Professor:** E. J. Waller; **Commanders:** M. B. Lechleiter, W. R. Olson, R. L. Wright; **Associate Professors:** J. W. Neil, D. F. Haber; **Lieutenant Commanders/Majors:** W. J. Wysocki, L. E. McCullough, E .D. Conner, A. B. Trammell, E. J. Mahon, K. F. Robinson, A. A. Carretta, Jr., A. T. Narro, W. F. Hardin, R. W. Austin (USMC), L. A. Bickley (USMC), T. W. Rogers (USMC); **Assistant Professors:** C. F. Olsen, W. D. Thayer, F. A. Skove, S. A. Matin; **Lieutenants/Captains:** J. R. Lund, D. R. May, J. C. Richardson, W. B. Shoemaker, R. P. Hardison, T. S. Althouse, P. L. McCammon, J. L. Hammer, G. O. Williams, R. W. Seiler, S. G. Bihler (USMC); **Lieutenant (j.g.):** R. B. Smith.

Mission

The mission of the Weapons Department is to provide every midshipman with the supplementary engineering background essential to an understanding of the principles that underlie all modern naval weapons systems; to provide a minors program for those midshipmen who show a particular interest in pursuing a broad engineering program in weapons design, usage, and application, which also prepares the participant for graduate study; and to offer a majors program with electives of appropriate breadth and quality to challenge and enhance the academic potential of superior students in the weapons field.

Facilities

ANALOG AND SYSTEMS SIMULATION LABORATORY. The Analog Laboratory includes 16 basic partially expanded Electronics Associates precision analog solid state electronic computers, TR–10 and 20 Models; one fully expanded TR–10 Model computer; five fully expanded TR–20 Model computers, and one partially expanded TR–48 Model. These units are available for a variety of applications in problem solving, simulation, and research studies. They are mounted

on mobile stands to facilitate their utilization. Auxiliary equipment includes X–Y and time-strip plotters for recording output data from computers.

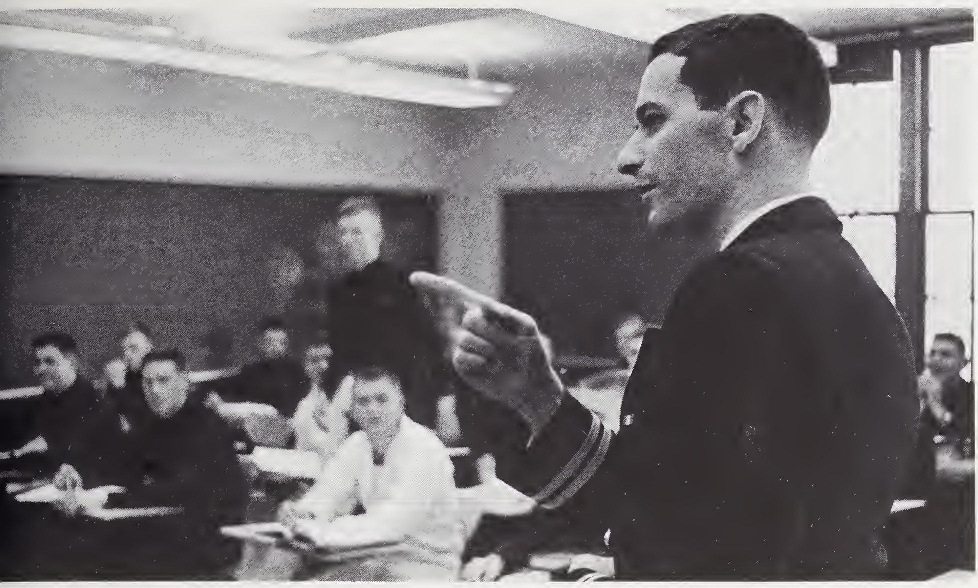
EXPLOSIVES LABORATORY. Laboratory facilities provide for miniaturized studies in explosive processes and effects. Special equipment developed by the Weapons Department provides for rocket thrust stand testing, dispersion test and study, observation and test of explosive blast effects, strength test of explosives using Trauzl blocks, vacuum cone study, ballistics range testing, metal forming by explosives, and shaped charge study.

AUTOMATIC CONTROL SYSTEM LABORATORY. Laboratory facilities include special automatic control system study panels developed and constructed by the Weapons Department technical staff. Recording and measuring devices are available with each panel to support the basic equipments. The panels permit the students to solve a variety of problems related to their studies in weapons control systems.

DIGITAL TECHNOLOGY LABORATORY. Laboratory facilities provide support for the study of digital computer technology. Equipment includes BiTran Six digital logic devices with ancillary support items and Digilab logic boards.

SPECIAL LABORATORIES. Electronic, environmental, ballistic support, and special project laboratories are available for research.

CLASSROOM TELEVISION. A closed-circuit classroom television installation provides live and taped programs to 14 classrooms over one of three channels. A single studio and two remotely located terminals are available for television programing with two mobile camera units.



CORE COURSES

W102	Introduction to Naval Engineering and Weapons Systems
W411	Weapons Systems Control
W413	Ballistics and Weapons Control

MAJORS-MINORS PROGRAM

Systems Engineering (Weapons)

Required Courses

W211	Introduction to Systems (General Ordnance)
W332	Systems Engineering Analysis I—Linear Systems
W312	Systems Engineering Analysis II
W707	Computer Programing and Utilization
S741	Electronics
S620	Electric Circuit Principles (in lieu of S305)
S740	Introduction to Active Circuits (in lieu of S306)
E305	Thermodynamics [1]
E306	Fluid Mechanics [1]

[1] *May be substituted for E313 and E314 with concurrence of advisor.*

Elective Courses

To achieve a minor in Systems Engineering, the student must complete the above required courses, two courses from Elective A and one technical elective approved by the advisor. To achieve a major, the student must complete the minor program, W931, W432, and one additional course from Elective A or B.

Elective A

W432, W931, W932, W933, W934, and W951.

Elective B

W904, W905, E601, E606, E759, E809, M601, M606, M751, M752, M671, S704, S821, S840, S841, and S844.

Course Descriptions

W102 INTRODUCTION TO NAVAL ENGINEERING AND WEAPON SYSTEMS. *Three Sem Hrs (3–0).* The operation, characteristics, and capabilities of naval engineering and weapons systems are explored along with their interrelation. The general physical and operational characteristics of ship-propulsion systems, surface ship guns, ASW and SAM systems, auxiliary engineering systems, and damage control systems are discussed, stressing the capabilities, limitations, and interdependence of the various systems. Laboratory/participation phase follows immediately during summer at-sea training with the Fleet.

W211 INTRODUCTION TO SYSTEMS (GENERAL ORDNANCE). *Four Sem Hrs (3–2).* This study of the naval weapons systems concept and the basic theory involving system components serves as an introduction to more advanced courses in the weapons systems sequence. Weapons control systems, launching systems, propulsion systems, warhead systems, damage mechanisms, and dispersion are covered. *Prereq: S211, M215.*

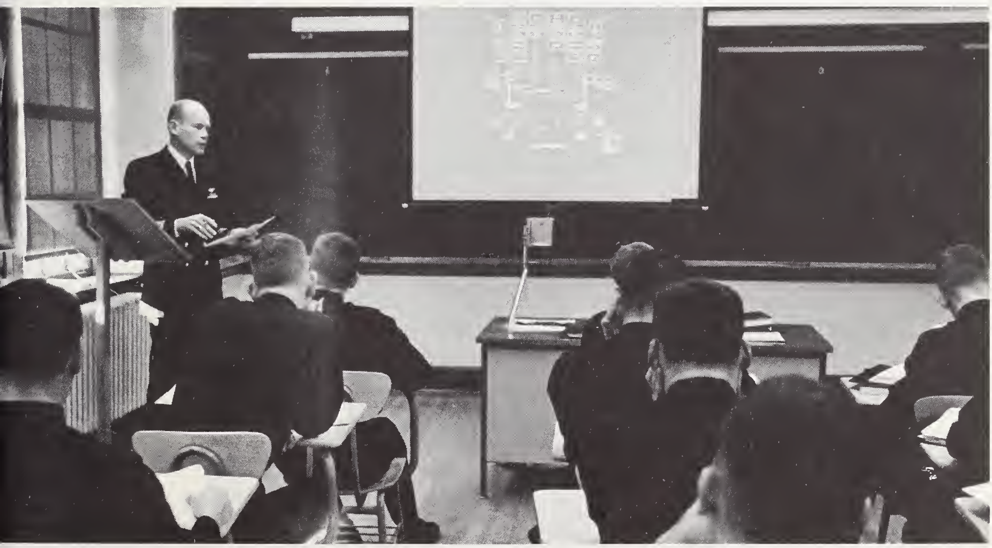
W312 SYSTEMS ENGINEERING ANALYSIS II. *Four Sem Hrs (3–2).* Devoted primarily to the analysis of linear weapons systems. Kinematics and transformation of coordinate systems as applied to modern weapons systems, weapons station, target, and projectile motion. Solution of the classic fire control problem as an applicaton of linear systems. Guidance, control, and the various flight paths of modern weapons systems. *Prereq: W332, S740 or S306.*

W332 SYSTEMS ENGINEERING ANALYSIS I—LINEAR SYSTEMS. *Four Sem Hrs (3–2).* Modeling of physical systems; the formulation of descriptive equations of physical systems, state-space forms, and vector-matrix models. Physical systems considered include combinations of one or more sub-systems from the electrical, electronic, mechanical, hydraulic, thermal, optical, or acoustical fields. Applied mathematical operational techniques such as convolution, correlation, Laplace and Fourier transforms, and matrix inversion by digital computer are covered where pertinent to linear systems analysis. The topology of linear systems such as block diagrams and signal flow graphs and their reduction; time response of systems, including outputs to such standard inputs as the impulse, step, ramp and sinusoid; introduction to automatic control as an application of linear analysis; and analog computer simulation theory and laboratory applications. *Prereq: S212, S620, M224.*

W411 WEAPONS SYSTEMS CONTROL. *Four Sem Hrs (3–2).* A systematic approach to weapons systems performance, requirements, and the dynamics of the basic components of weapons systems. Linear analysis of open and closed-loop systems utilizing root-locus and frequency-response techniques, with emphasis on graphical solutions and analog simulation. *Prereq: M224, S306.*

W413 BALLISTICS AND WEAPONS CONTROL. *Four Sem Hrs (3–2).* Principles of selected phases of the weapons system, including energy sources, trajectories and flight paths, and damage criteria. Research and development, design and testing of system components such as warheads, both nuclear and conventional, fuzes, guidance and control systems. Kill probability, overall weapon system effectiveness, and weapons control computers. Laboratory work includes explosive testing, rocket engine testing, warhead design and testing, and kill probability and dispersion. *Prereq: W411.*

W432 SYSTEMS DESIGN. *Four Sem Hrs (3–2).* A comprehensive course in systems design concepts essential to the understanding of modern weapon systems, with particular emphasis on laboratory applications. Guest lecturers.



Weapons

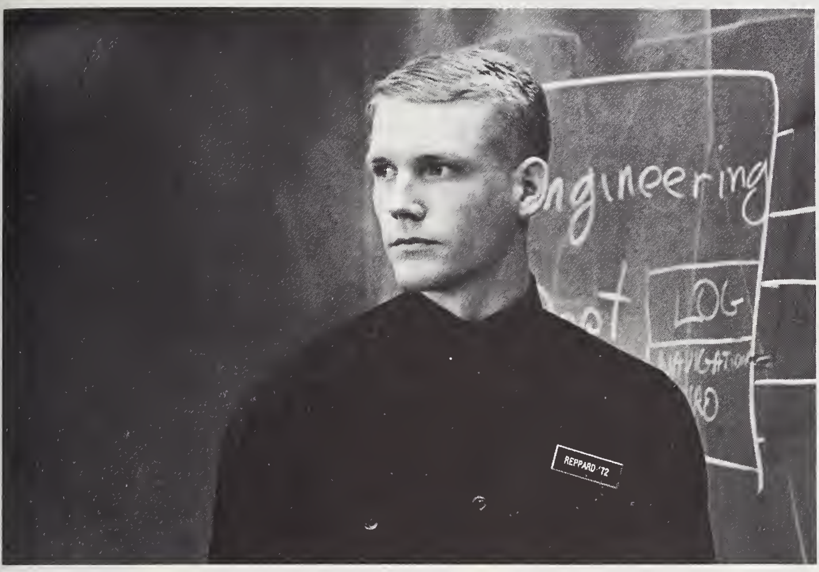
A major system design project undertaken by students in the laboratory reinforces the application of general systems morphology taught in the classroom. The final course in systems engineering programs. *Prereq: W931 and 1/C standing.*

W707 COMPUTER PROGRAMMING AND UTILIZATION. *Three Sem Hrs (2–2).* An introduction to the principles of computer programming, using machine language, FORTRAN IV, and BASIC. Problem solving techniques involving modern numerical methods are employed to solve a wide range of problems.

W708 ANALOG COMPUTERS—FUNDAMENTALS, PROGRAMMING, AND OPERATION. *Three Sem Hrs (3–0).* Principles of analog computation to include computer functioning, the solution of linear and nonlinear system equations, methods for scaling both in time and magnitude, and simulation of linear and nonlinear systems. Problem solution for linear systems is performed in the time and Laplace domains. Extensive use is made of the computer. *Prereq: M224, or concurrently enrolled.*

W904–905 INDEPENDENT STUDY/PROJECT. *Three Sem Hrs Each Term (3–0, 3–0).* A creative, technical, independent study/project in an aspect of the weapons field. Study requires the student to have a Weapons Department Advisor. If the study/project is of sufficient magnitude or depth, it may be continued for a second semester. *Prereq: Approval of the Head of Department.*

W931 AUTOMATIC CONTROL SYSTEMS I. *Four Sem Hrs (3–2).* Analysis of automatic control systems. Open and closed-loop systems. Formulation of transfer functions from physical systems, including mechanical, electrical and hydraulic components. Block diagrams and signal flow graphs. Stability analysis in the S-plane and in the frequency-response plots. Introduction to design techniques. Simple compensation schemes. Digital and analog computers are used extensively in the laboratory applications of the theory. *Prereq: W332, S840, M704, or M751; Coreq: E715, E759, or E815.*



W932 AUTOMATIC CONTROL SYSTEMS II. *Four Sem Hrs (3–2).* An extension of the theory developed in Automatic Control Systems I, with the emphasis in linear systems on synthesis as opposed to analysis in the previous course. This is done by both the frequency-response and S-plane approaches. Introduction to optimum parameter synthesis. Effect of nonlinear components and nonlinear control systems behavior. Techniques for the analysis of nonlinear systems, including piecewise linear analysis, describing function, and phase-plane analysis. Introduction to state-variable techniques and Liapunov's second method. Laboratory instruction making use of digital techniques and analog simulation of both linear and nonlinear systems. *Prereq: W931.*

W933 DIGITAL TECHNOLOGY. *Four Sem Hrs (3–2).* An introduction to the logical organization and internal functioning of digital devices, with emphasis on the general purpose computer. The subject matter includes sequential machine theory, absolute machine language, Boolean algebra, logical synthesis of switching circuits, devices employed in the fabrication of computers and computer systems, and military applications of digital devices. *Prereq: W707.*

W934 SAMPLED-DATA CONTROL SYSTEMS. *Four Sem Hrs (3–2).* A study of the response of control systems to discrete and sampled-continuous inputs; basic theory of sampling, quantizing and data reconstruction; the Z-transformation and the Z-plane; stability of sampled-data feedback systems; compensation in the Z-plane; and optimization of system performance through the use of digital components. *Prereq: W931.*

W951 APPLICATIONS OF COMPUTER TECHNOLOGY. *Four Sem Hrs (3–2).* A study of the application of individual and combined digital and analog techniques to the solution of problems arising in weapons systems. Hybrid systems are designed and tested. Emphasis is placed on problem analysis, including problem definition and plan of attack, and laboratory solution. Course is shaped in accordance with the students' needs and desires. Depending upon extent, one or more projects may be undertaken by each studen . *Prereq: W933.*

Professional Training

The Commandant of Midshipmen is responsible for the Professional Training Program. The program is a vital part of each midshipman's professional training during his four years at the Academy. It includes certain courses offered at the Academy during the academic year and during the summer, as well as summer training conducted away from the Academy with Fleet operational and training units.

Midshipmen are graded on their interest and performance in the professional program just as they are for their performance in the academic program. A midshipman's overall standing within his class at graduation depends very significantly on his grades for professional training.

The Executive and Physical Education Departments and some academic departments offer courses in the professional program. Courses and drills offered by these departments are described in the following chronological summary. P-courses are offered by the Naval Science Department, X- and T-courses by the Executive and Physical Education Departments, respectively. Other departmental letter designations are the same as those used with the academic program.

Fourth Class Summer

P100 BASIC SEAMANSHIP AND NAVIGATION. Practical instruction in elementary seamanship, including marlinspike and deck seamanship, sailing of knockabouts and yawls, power-boat handling, rules of the nautical road, visual signaling (flashing light and flags), elementary piloting and lookout procedures, and indoctrination in the fundamentals of shiphandling aboard Yard Patrol Craft.

T100 PHYSICAL EDUCATION ORIENTATION AND INDOCTRINATION. Preliminary examinations in swimming, posture, and athletic ability. Testing in physical achievement with subsequent preparation of class grouping. Physical education drills in fundamentals of swimming, boxing, wrestling, posture, and personal conditioning. Indoctrination drills in lacrosse, fencing, soccer, rugby, gymnastics, crew, golf, tennis, squash racquets, and track.

W100 SMALL ARMS. Practical instruction in nomenclature, field stripping, and assembly of small arms. Firing of service rifle and pistol. Those who qualify are awarded the U.S. Navy Expert Rifleman Medal and/or the U.S. Navy Expert Pistol Medal.

X100 ORIENTATION AND INDOCTRINATION. An elementary course to orient the new midshipman to the Naval Academy and to the naval service, to indoctrinate him with the way of life at the Naval Academy, including his duties as a midshipman and the Academy's mission, ideals, standards, traditions, and customs.

Y100 FUNDAMENTALS OF NAVAL HYGIENE. The fundamentals of personal hygiene, including mental and physical hygiene and first aid.

Fourth Class Year

T101 & T102 PHYSICAL EDUCATION. Fundamentals of badminton, soccer, swimming, boxing, wrestling, gymnastics, golf, tennis, posture, volleyball, basketball, handball, bowling, squash racquets, and personal conditioning. Tests in applied strength, agility, swimming, boxing, wrestling, and gymnastics.

X101 & X102 INFANTRY DRILL. Two hours per week of infantry drills and dress parades for eight weeks during both the fall and spring.

Third Class Summer

P201 AT-SEA TRAINING. During summer at-sea training with the Fleet, the Third Classman is introduced to Navy life at sea, to shipboard organization and relationships, and to the leadership opportunities and problems of a junior officer. He actively participates in a wide range of shipboard tasks and evolutions, under normal and emergency conditions both at sea and in port. He stands deck and engineering watches and becomes familiar with shipboard equipment. He is required to complete the "Functional Training Log" and "Training Syllabus" for Third Classmen. Upon return to the Academy, he takes a comprehensive examination on his training.

NAV 59
Navigator

Third Class Year

T201 & T202 PHYSICAL EDUCATION. Continuation of instruction in swimming, boxing, wrestling, personal conditioning, tennis, and gymnastics, with tests in applied strength, agility, swimming, boxing, wrestling, and gymnastics.

X201 & X202 INFANTRY DRILL. Two hours per week of infantry drills and dress parades for eight weeks during both the fall and spring.

Second Class Summer

AVIATION, SUBMARINE AND AMPHIBIOUS TRAINING. Broad professional training in aviation, submarine, and amphibious operations at bases away from the Naval Academy. In addition, during Second Class Summer, each midshipman completes four weeks of professional academic training at the Naval Academy: N311 Operations and Tactics I (2–2), and H300 Speech (1–0).

Second Class Year

T301 & T302 PHYSICAL EDUCATION. Advanced instruction in swimming, boxing, tennis, golf, officiating, principles of personal conditioning, and hand-to-hand combat. Tests in applied strength, agility, swimming, and boxing.

X301 & X302 INFANTRY DRILL. Two hours per week of infantry drills and dress parades for eight weeks during both the fall and spring.

First Class Summer

P400 AT-SEA TRAINING. During his second summer of at-sea training with the Fleet, the First Class midshipman undertakes the duties of a junior division officer, handling administrative responsibilities and standing appropriate watches. He completes a considerable amount of practical work in navigation, taking sights and determining the ship's position. Among references used during his training are the *Watch Officer's Guide*, the *Division Officer's Guide*, and the *Ship's Organization and Regulations Manual*. He is required to complete the "Functional Training Log" and "Training Syllabus" for First Classmen, summarizing his watches and his work in engineering, seamanship, navigation, weapons, operations, and in basic tactics. He receives a comprehensive examination on his at-sea training upon return to the Naval Academy.

First Class Year

T401 & T402 PHYSICAL EDUCATION. Instruction in advanced swimming, personal conditioning, tennis, golf, and athletic administration. Tests in physical fitness.

X401 & X402 INFANTRY DRILL AND NAVAL ORIENTATION. Two hours per week of infantry drills and dress parades for eight weeks during both the fall and spring. During the winter months, two hours per week of naval orientation lectures. The First Class lectures cover areas of importance to the junior officer. The syllabus includes lectures and seminars on professional development, career patterns, administrative responsibilities, enlisted personnel management, leadership, personal finance, fitness reports, legal assistance, and current military affairs.

Physical Education Department

Head of Department: Captain J. O. Coppedge; **Executive Officer:** Commander J. S. Donaldson; **Professors:** A. J. Rubino; **Associate Professors:** R. H. Swartz, F. H. Warner, C. W. Phillips, J. N. Rammacher, W. P. Bilderback, J. H. Higgins, H. A. Muller, Jr., A. R Deladrier, J. M. Gehrdes, A. M. Potter, J. C. Duff, H. W. Lenz, S. N. Belichick; **Assistant Professors:** E. P. Smith, J. M. Cloud, E. C. Peery, D. P. Smalley, L. W. Lawrence, R. L. Brown, Jr., A. A. Cantello, W. A. Savering; **Lieutenants/Captains:** F. K. Duffy, J. J. Cistriano, A. N. Davidson, R. F. Testa, R. C. Shands (USMC), J. R. Kopka (USMC), R. K. Kinne, M. A. Fryer; **Instructors:** R. J. Kopnisky, D. W. Purdy, Jr.; **Lieutenants (j.g.):** L. E. Hester, Jr.

Mission

The physical development of midshipmen is the primary mission of the Physical Education Department. This directly supports the mission of the Naval Academy. In carrying out its mission, the Department endeavors to develop each midshipman's skill, strength, endurance, agility, and competitive spirit in order that he may acquire useful habits of physical fitness, be capable of surmounting physical hardships, and be proficient in training and instructing others.

Related objectives of the Physical Education Department are:

☐ To provide opportunities to develop qualities of moral and physical courage, group loyalty, fair play, leadership ability, and quick thinking while under pressure in highly competitive situations;

☐ To develop proficency in aquatics and confidence in meeting emergency situations in the water;

☐ To develop requisite interest and skill in carry-over sports to insure a proper level of physical fitness after graduation;

☐ To develop confidence and ability in defending against personal attack, and

☐ To provide instruction in the principles and methods employed in organizing, supervising, and conducting athletic and physical education programs.

Facilities

The Department's athletic facilities are extensive. The Field House, completed in 1957, covers an area approximating a city block. It provides facilities for basketball, baseball, track, wrestling, boxing, and other sports throughout the year. It is also used for public gatherings, band concerts, etc. The south wing houses a visiting team dormitory with facilities for more than 200 persons. The north wing includes classrooms, a multi-purpose gymnasium, squash courts, "Misery Hall" (first aid and treatment), and other facilities in support of the physical education and athletic programs.

There is a large gymnasium, Macdonough Hall, named in honor of Commodore Thomas Macdonough, Naval hero of the War of 1812. It is approximately 400 feet long and 100 feet wide, and includes a gym deck, an instruction pool, squash and handball courts, wrestling and fencing lofts, three boxing rings, and another "Misery Hall." It also contains the Natatorium, one of the largest covered pools in the United States (150 feet long, 60 feet wide).

In addition, the Naval Academy has the following areas available for recreation and competition: recreational tennis courts (24), varsity tennis courts (6), baseball stadium, golf course (18 holes), and recreational fields (over 100 acres).

The Athletic Program

Through athletics, the Naval Academy fulfills its responsibility to develop midshipmen physically—one third of its three-pronged mission. Few institutions in the Nation offer a more all-encompassing athletic program. Twenty-one varsity and 23 intramural sports challenge every talent and interest. All midshipmen participate, either at the varsity or intramural level. The varsity program is conducted by the Athletic Department, while the Physical Education Department conducts the intramural program.

Excellent facilities support the athletic program. A large and modern field house accommodates both athlete and spectator for varsity basketball, wrestling, and track. The one-eighth mile dirt track surrounds a large open area containing a full-sized baseball infield. Other field house facilities include squash courts and a multi-purpose gymnasium.

Swimming pools, boxing rings, fencing and wrestling lofts, rifle and pistol ranges, and handball and badminton courts complete the indoor facilities.

Outside, there are more than 100 acres of lighted playing fields, an 18-hole golf course, tennis courts, and a baseball field.

Home football and lacrosse games are played in the Academy's nearby Navy-Marine Corps Memorial Stadium, with seating for 28,000 spectators. Dedicated in 1959, this beautiful memorial was built entirely with private funds donated primarily by officers and men of the Navy and Marine Corps.

Intercollegiate Athletics

Midshipmen meet topflight competition in 21 varsity sports from football to fencing, swimming to sailing, and soccer to squash.

Navy meets its most time-honored opponent, Army, in 17 different engagements each year. Other top-level competition is regularly provided by such opponents as Notre Dame in football, Princeton in basketball, Columbia and New York University in fencing, Penn State in gymnastics, Johns Hopkins and Maryland in lacrosse, Lehigh in wrestling, Harvard in squash, and Yale in swimming.

In addition to a busy home schedule, Navy teams travel regularly along the Eastern seaboard and, on occasion, nationally in search of competition. Within recent years the football team has competed in such far-flung cities as San Francisco, Dallas, Boston, Denver, Detroit, and Atlanta, to name just a few.

Win or lose (but usually winning), the midshipmen give a spirited account of themselves. Navy teams and athletes regularly earn their share of Eastern, National, and All-American honors.

The Naval Academy offers midshipmen the opportunity to compete in the following varsity sports: baseball, basketball, crew (heavyweight and lightweight), cross country, fencing, football (varsity and lightweight), golf, gymnastics, lacrosse, pistol, rifle, sailing, soccer, squash, swimming, tennis, track (indoor and outdoor), and wrestling.

FALL SPORTS. Navy football needs little introduction. The Army-Navy game, the Navy's John Cartwrights, Rob Taylors, Roger Staubachs, Joe Bellinos, Slade Cutters and other great players have helped spread the Spirit of the Naval Academy to every corner of the land. In addition to Army, a challenging 10-game schedule features such fine teams as Notre Dame, Penn State, Syracuse, Texas, Miami, and the Air Force Academy.

Football is not restricted to the varsity level. Spots are also open on Navy's lightweight team, a perennial contender for the Eastern championship, the junior varsity squad, or the plebe eleven.

Cross country, sailing, and soccer share the autumn spotlight with football. National Collegiate Champions in 1964, Navy's soccer team received five consecutive bids to the Collegiate tournament from 1963–67.

WINTER SPORTS. The tempo heats up as the arrival of winter drives the athletic program indoors. Here, midshipmen direct their energies to nine different sports.

Competing primarily in the East, Navy basketball teams have given an excellent account of themselves over the years. The fencing, rifle, pistol, and squash clubs are consistently in the running for National honors.

Wrestling, long a favorite at the Academy, saw Navy take the Eastern title in 1968. Gymnastics, swimming, and track complete the busy winter sports picture.

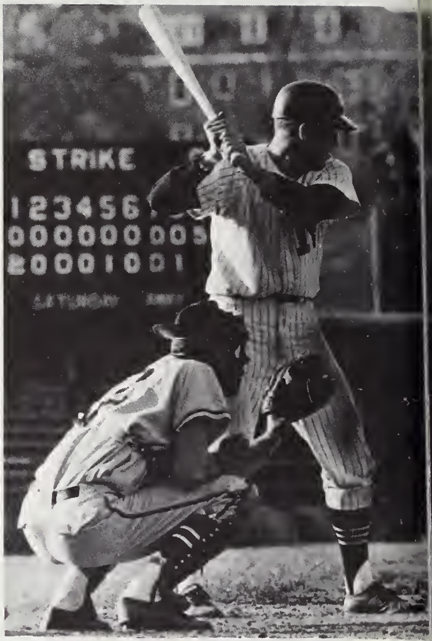
SPRING SPORTS. The familiar—baseball, tennis, golf, track—and the unusual—lacrosse, sailing, and crew, blend to produce a well-balanced spring program.

Navy competes in the Eastern Intercollegiate Baseball League, which includes the Ivy League schools and Army. The netters and golfers are also active in Eastern circuits.

The midshipmen's ambitious rowing program includes three shells—varsity, junior varsity and plebe, both heavyweight and lightweight. Navy's crew last competed in the Olympic Games in 1960. The midshipmen were gold medal winners for the United States in 1952.

Lacrosse—a highly popular spring sport—takes its roots from the rugged game originated by the American Indians. Navy won or shared eight consecutive National titles in lacrosse from 1960–67.

Varsity Sports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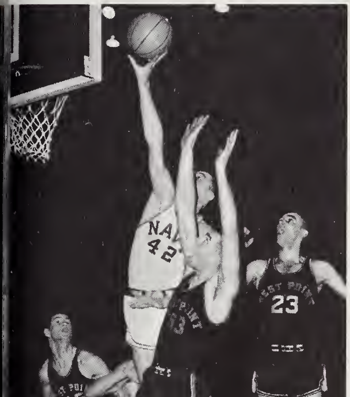
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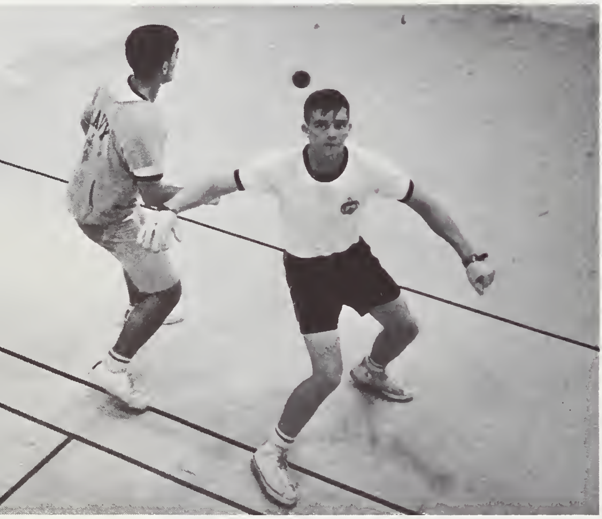
Intramural Sports



The Intramural Sports Program

Midshipmen not on varsity teams are required to participate in intramural sports. Thus, every midshipman at the Academy has the opportunity to enjoy the benefits of competitive athletics at a level appropriate to his athletic ability.

The intramural sports program is under the supervision of the Physical Education Department. Competition is organized at the battalion and company levels, and trophies are awarded to championship teams. Intramural sports include:

Basketball
Boxing
Crew
Cross country
Fencing
Field ball
Football
Gymnastics
Handball
Lacrosse
Rugby
Soccer
Softball—*fast pitch*
Softball—*slow pitch*
Squash
Swimming
Tennis
Touch football
Track
Volley ball
Water polo
Weight lifting
Wrestling

The Naval Academy Athletic Association

The Naval Academy Athletic Association is a non-profit organization charged by the Superintendent with the responsibility for providing and administering the intercollegiate sports program for the midshipmen. It is headquartered at the Naval Academy. The Association discharges its responsibility without the use of appropriated funds.

The Association arranges the varsity schedules, provides coaching staffs and equipment, and maintains a central office to handle the administrative details of the athletic program.

The Naval Academy, a member of the Eastern College Athletic Conference (ECAC) and the National Collegiate Athletic Association (NCAA), is represented in and conforms to the regulations of these organizations through the offices of the Naval Academy Athletic Association.

The Extracurricular Program

Life at the Academy offers midshipmen a wide-ranging choice of over 60 different extracurricular activities. Weekend dances and other social activities head the popularity list for many. Musically, there are the Glee Club, the Antiphonal Choir, the Protestant and Catholic Chapel Choirs, the Drum and Bugle Corps, the Concert Band, five separate combos, which provide a lively variety of music for informal dances and other social events, and the NA–10, the midshipmen's ever-popular dance band.

Members of the Brigade publish the *Lucky Bag*, the yearbook for each class; the *Trident Magazine*, a literary and professional publication; the *Log*, a less serious and more typical campus magazine; the *Trident Calendar*, embellished by photographs and cartoons; and *Reef Points*, a pocket-size guide to Academy and Navy organization, lore, and customs for the new plebes.

Dramatic activities include the Masqueraders and the Musical Clubs Show and their supporting groups: The Stage, Property and Make-up, and Juice (electrical) Gangs. Other interests find expression through such organizations as the Photographic Club, the Amateur Radio Club, the Scuba Club, the Art and Printing Club, the Brigade Activities Committee, the Public Relations Committee, Radio Station WRNV, and the Gun Club.

Academic and professionally oriented activities include the Foreign Relations Club, the Language Clubs, the Debaters, a Student Chapter of the American Institute of Aeronautics and Astronautics, and the Physics Honor Society. The Academy's professionally oriented sailing and YP Squadron programs are described on succeeding pages.

Sailing at the Academy has a serious professional purpose. It is also fun. The program is extensive and many faceted. And there is sailing for every taste—from basic instruction to ocean racing, and from leisurely afternoon cruising to the keen competition of high-performance Skipjack dinghies.

Skills and knowledge of seamanship and the sea gained under sail are the same basic skills and knowledge used by seamen for centuries. They are as relevant in bringing a ship safely home to port today as they ever were. Thus, by developing better seamen, the Academy's sailing program contributes to the development of better naval officers.

Sailing is easily the most popular extracurricular activity at the Academy, with almost 1,000 midshipmen engaged in competitive or recreational sailing. And, judging by the look of things along the seawall on weekends, sailing is equally popular with drags (dates).

The Academy has one of the finest sailing fleets in the world as well as some of the best known ocean racers. The fleet ranges from the 73-foot ketch, *Jubilee III*, through the 50-foot yawls, *Annie D* and *Gypsy*, to 12-foot interclub dinghies. Recently, three new standouts have been added to the ocean racing fleet: *Jubilee III*, an aluminum ketch; *Ondine*, renamed *Severn Star*, winner of many of the top distance races, and the renowned yawl, *Maradea*. Two Finns and four Flying Dutchmen provide an opportunity for Olympic-type competition.

The Naval Science Department conducts basic training in sail during

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Plebe Summer, using the Academy's fleet of thirty 26-foot knockabouts and twelve 44-foot Luders yawls. After Plebe Summer all sailing is voluntary, either varsity or extracurricular.

Twenty-six Skipjacks and five 30-foot Shields sloops are available to members of the Varsity Sailing Team . . . which races in intercollegiate competition from coast to coast. Other races during the academic year include open competition in the Chesapeake Yacht Racing Association aboard the Shields sloops, Luders yawls, and the larger yachts.

The Academy sponsors numerous intercollegiate and Bay regattas. Both the McMillan Cup and John F. Kennedy Memorial Regattas are hosted by the Academy. During the summer, the larger yachts are sailed in the open sea in such races as the Bermuda and Annapolis-Newport ocean races. Other races include the Gibson Island Yacht Squadron race to Cape May, the Chesapeake Lightship Race, the Cape May to Newport Race, the Marblehead-Halifax Race, and the Buenos Aires to Rio de Janeiro Race. Midshipmen skipper the yachts in Bay races and crew in ocean races.

Intercollegiate sailing is conducted by the Physical Education Department. Other sailing beyond the primary stage is administered by the Naval Academy Sailing Squadron, an organization of officers, faculty, and other devotees of sailing. Besides being highly popular, Squadron-arranged weekend sailing trips give midshipmen a chance to carry the spirit of the Navy to nearby ports.

The Naval Academy's YP Squadron is organized for midshipmen who desire more extensive training afloat than is offered by summer at-sea training and the Naval Science Department's curriculum. The Squadron consists of seven Yard Patrol craft assigned one to each of the six battalions with the seventh assigned as flagship of the entire Squadron.

The organization and practices of the YP Squadron are very similar to those of Fleet destroyer squadrons on duty around the world. The "officers" are midshipmen First Class selected annually in recognition of their ability to fulfill command positions. The Squadron Commodore is responsible for the overall performance and excellence of the Squadron, including the coordination of training, proficiency competition, inspections, and cruises. Assisting him are a Chief Staff Officer, two Division Commanders, and an Administration Officer. Completing the staff is an Engineering Officer who supervises training in engineering and insures that engineering equipment is operated and maintained properly. Each Yard Patrol craft is commanded by a First Classman who is assisted by a 20-man crew composed of midshipmen from all classes.

Training is serious business during the week. Crews get underway on Tuesday, Thursday, and Friday afternoons. Mondays and Wednesdays are reserved for classroom drills and instruction. In addition to daily training sessions, weekend cruises are conducted to Washington, D.C., Norfolk, Va., Philadelphia, and to various Chesapeake Bay ports.

Competition between YP's for the "Battle Efficiency Pennant" is keen. The crew adjudged most proficient overall in tactics, deck seamanship, piloting, communications, and engineering is the winner.

Administration

The administration of the Naval Academy is in many respects analogous to that of any college. A Board of Visitors performs the broad supervisory functions of a board of trustees. The Superintendent, like a college president, is the executive head of the Academy. He is assisted by the Commandant of Midshipmen, whose function is somewhat like that of a dean of students, the Academic Dean, and an administrative staff. The Superintendent, the Commandant, the Academic Dean, and other senior members of the faculty comprise the Academic Board, which makes major academic decisions and sets physical training come under the Commandant. The Academic Dean heads the academic program.

The Board of Visitors

A Board of Visitors to the Naval Academy is constituted annually of the Chairman of the Committee on Armed Services of the U.S. Senate, or his designee; three other members of the Senate designated by the Vice President of the United States or the President *pro tempore* of the Senate, two of whom are members of the Committee on Appropriations of the Senate; the Chairman of the Committee on Armed Services of the U.S. House of Representatives, or his designee; four other members of the House of Representatives, two of whom are members of the Committee on Appropriations of the House of Representatives; and six persons designated by the President of the United States.

The Board meets at least once each year at the Naval Academy to inquire into the state of morale and discipline, the curriculum, instruction, physical equipment, fiscal affairs, academic methods, and related matters, and submits a written report of its action and its views and recommendations to the President of the United States.

The members of the 1968 Board of Visitors follow:

Appointed by the President of the United States

Mr. Guy Stillman, Chairman
Consulting Engineer, Phoenix, Ariz.
Dr. Wilson H. Elkins
President, University of Maryland
Dr. Edwin D. Etherington
President, Wesleyan University
Dr. Edwin D. Harrison
President, Georgia Institute of Technology
Mr. George W. Grider
General Counsel and Secretary
The Carborundum Company
Mr. William A. Shea
Attorney, New York City

Appointed by the Vice President

Senator Paul J. Fannin, Arizona
Senator John O. Pastore, Rhode Island
Senator Ralph W. Yarborough, Texas

Appointed by the Speaker of the House

Representative Daniel J. Flood, 11th District of Pennsylvania
Representative Glenard P. Lipscomb, 24th District of California
Representative Hervey G. Machen, 5th District of Maryland
Representative Rogers C. B. Morton, 1st District of Maryland

Ex Officio Members

Senator Daniel B. Brewster, Maryland
(Designee of Senator Richard B. Russell, Chairman, Committee on Armed Services, U.S. Senate.)
Representative Floyd V. Hicks, 6th District of Washington
(Designee of Representative L. Mendel Rivers of South Carolina, Chairman, Committee on Armed Services of the U.S. House of Representatives.)

The Academic Advisory Board

The Academic Advisory Board was formed by the Secretary of the Navy to advise the Superintendent concerning the Academy's academic program. The Board held its initial meeting at the Academy in the fall of 1966. Meetings are held periodically during the year.

Members of the Academic Advisory Board are as follows:

Dr. Herbert E. Longnecker, Chairman
President, Tulane University

Dr. Carey Croneis
Chancellor, Rice University

Dr. Milton S. Eisenhower
President Emeritus, The Johns Hopkins University

Dr. Richard G. Folsom
President, Rensselaer Polytechnic Institute

Mr. John F. Gordon
Member of the Board of Directors,
General Motors Corporation

Mr. Harold H. Helm
Chairman of the Executive Committee,
Chemical Bank New York Trust Company

Mr. Augustus C. Long
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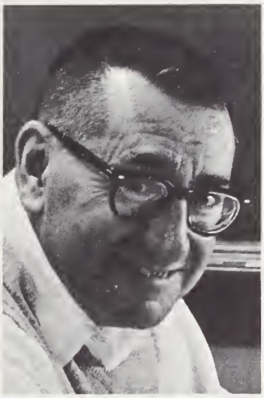

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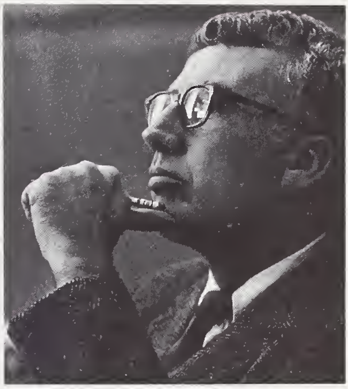

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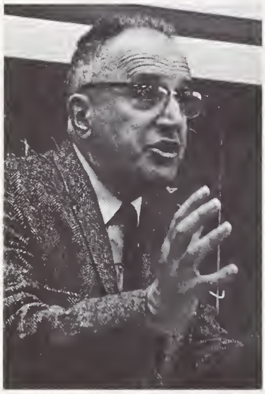
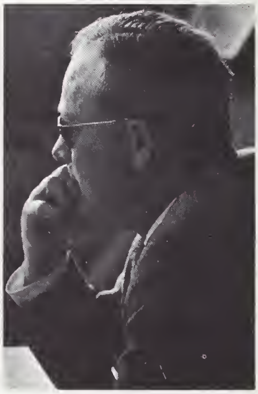


Assoc. Prof. Boyajy

Lt. Norman



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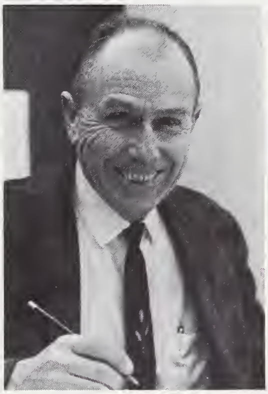
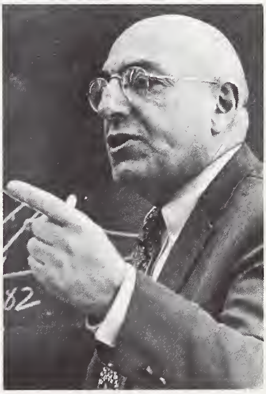


Prof. Robinson



Prof. Saslaw

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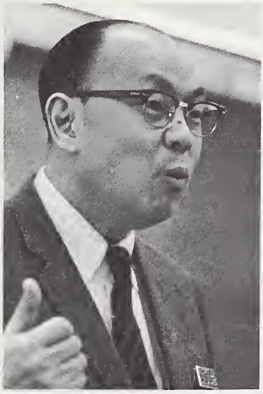
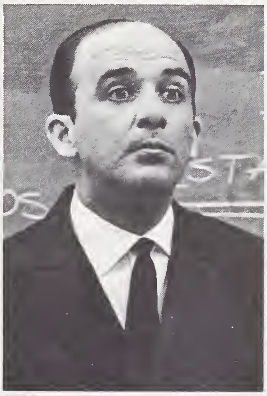

Asst. Prof. Lee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Lieutenant Michael T. Corgan, USN; *B.S., U.S. Naval Academy.*

Lieutenant Thomas H. Cramer, USN; *B.S., University of Colorado; M.S., Naval Postgraduate School.*

Commander Jerry D. Dancer, USN; *B.S., U.S. Naval Academy.*

Lieutenant Commander Charles E. Davis, USN; *B.S., U.S. Merchant Marine Academy; M.S. Naval Postgraduate School.*

Lieutenant William E. Davis, USN: *B.S., U.S. Naval Academy.*

Lieutenant Ralph F. DeWalt, USN; *B.S., Moravian College; M.S.. Naval Postgraduate School.*

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Commander John F. Foster, USN; *B.S., U.S. Naval Academy.*

Lieutenant Henry W. Fox, USN; *B.S., University of Colorado.*

Lieutenant Roger A. Garrett, USN; *B.S., South Dakota State University; M.S., Naval Postgraduate School.*

Lieutenant Robert E. Gasser, USN; *B.S., U.S. Naval Academy; M.S., Naval Postgraduate School.*

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Lieutenant John C. Maheu, USN; *B.S., U.S. Naval Academy.*

Lieutenant James A. Maxwell, USNR; *B.A., Middle Tennessee State Univ.*

Lieutenant Larry D. McCullough, USN; *B.S., U.S. Naval Academy.*

Commander Donald A. McGuiness, USN; *B.S., Northeastern University; B.S., Naval Postgraduate School.*

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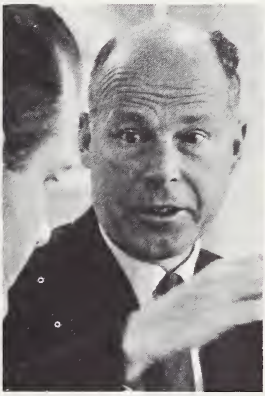
Lieutenant Russell G. Porter, USNR; *A.B., University of California; M.S., Humbolt State College.*

Lieutenant Warren T. Rayder, USNR; *B.A., Valparaiso University.*

Lieutenant John H. Reed, USN; *B.S.,*

Lt. Hart


Asst. Prof. Tate

Lt. Maheu

University of North Carolina.

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Lieutenant Paul K. Rogers, III, USNR; *A.B., Colby College.*

Lieutenant F. Patrick Roll, USN; *B.S., Canisius College.*

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Lieutenant Robert F. Weir, USN; *B.S., U.S. Naval Academy.*

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Lieutenant Commander Robert L. Field, USN; *B.A., Occidental College.*

Lieutenant Commander Frederick M. Fleeman, USN; *B.S., U.S. Naval Academy.*

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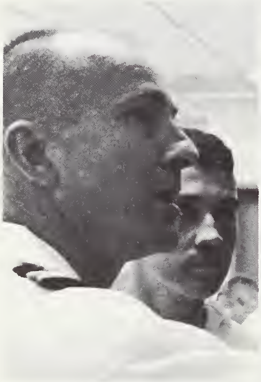
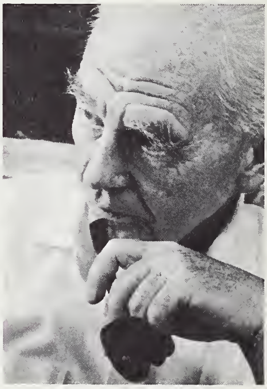

LCdr. Lassetter

LCdr. Fleeman


Prof. Pinkston

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Associate Professor Wesley K. Kay; *B.S.(E.E.), Tufts University; M.S. (E.E.), University of Kentucky.*

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Lieutenant Ted P. Smith, USNR; *B.E.E., Georgia Institute of Technology; M.B.A., Indiana University.*

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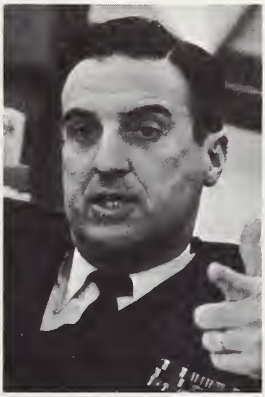
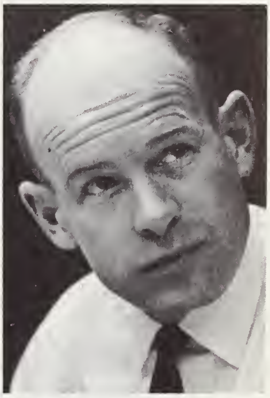
Lieutenant Richard W. Seiler, USN;

Asst. Prof. Olsen



LCdr. Wysocki



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Mr. Lee R. Corso; *B.S., M.S., Florida State University.*

Mr. Gale E. Daugherty; *B.A., M.A., Idaho State University.*

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Mr. Carl W. Schuette; *B.A., Marquette University.*

Mr. Michael J. Stock; *B.S., Northwestern University.*

Mr. William P. Templin; *B.S., Purdue University.*

Mr. James T. Todd; *B.S., M.S., University of Virginia.*

Mr. Carl F. Ullrich; *B.S., Cornell University.*

Mr. J. Robert Williams; *Class A, PGA Member.*

Prizes and Awards

Each June Week more than 80 prizes and awards, provided by individuals and a wide variety of organizations, are presented to midshipmen in recognition of their noteworthy accomplishments in such areas as academics, leadership, professional studies, debate, public speaking, sailing, marksmanship, and athletics.

The Museum

The Naval Academy Museum serves as inspiration to the men of the Brigade by providing tangible evidence of some of the most glorious episodes in our Nation's history. Its collection of more than 50,000 individual items also provides an important reference source for the teaching of naval history.

While most of the Museum's valuable collections are located within the Museum, other items of exceptional interest and value are located in the Chapel, Memorial Hall, the Library, and in other buildings throughout the Academy. The Museum contains some of the finest ship models in the world, including many from the famous Rogers Collection, a superb collection of 13 maritime paintings by Edward Moran, perhaps the largest collection in the world of items relating to the life and work of John Paul Jones, the table from the mess deck of the battleship *Missouri* on which was signed the instrument of surrender ending World War II, and literally thousands of other significant items relating to the history of our Navy and of the Naval Academy. In addition, the Museum has valuable collections of manuscripts and extensive photographic files.

Museum items in Bancroft Hall include the flag hoisted by Commodore Oliver Hazard Perry at the Battle of Lake Erie on which were emblazoned the immortal words of the dying James Lawrence, "Don't Give Up The Ship!"; the original marble bust of John Paul Jones by Jean Antonine Haudon; and fine portraits of distinguished naval officers. In the Chapel Crypt will be found John Paul Jones' commission as a captain, signed by John Hancock, his membership certificate in the Society of the Cincinnati, signed by George Washington, and the dress sword presented to him by King Louis XVI. The Library contains a number of ship models from the Rogers Collection and numerous historic flags, including the only known captured British Royal Standard.

The U.S. Naval Academy Alumni Association

The U.S. Naval Academy Alumni Association, Inc., is a private organization whose mission is to serve and support the United States, the Naval Service, and the Naval Academy by furthering the highest standards of the Naval Academy; by seeking out, informing, encouraging, and assisting outstandingly qualified young men to pursue careers in

Alumni House

the Navy and Marine Corps through the Naval Academy; and by initiating and sponsoring activities which will perpetuate the history, traditions, memories, and growth of the Naval Academy and bind alumni together in support of the highest ideals of command, citizenship, and government.

All alumni of the Naval Academy are eligible for membership in the Association—graduates, nongraduates, active duty officers, retired officers, and resigned alumni.

Alumni House (Ogle Hall of pre-Revolutionary Annapolis fame) is the Association's distinguished national headquarters. Files and records are maintained on all ex-plebes dating from the establishment of the present Naval Academy in 1845 through the classes now enrolled. The many functions of the Association include annual publication of the *Register of Alumni*, publication of *Shipmate*, the alumni magazine, support of class and chapter organizations, and service and support of many activities at the Academy throughout the year.

The United States Naval Institute

Headquartered in Annapolis, the United States Naval Institute is a voluntary, private, nonprofit association of more than 56,000 members formed in 1873 for "the advancement of professional, literary, and scientific knowledge in the Navy." The membership includes officers and enlisted personnel from all branches of the military services, distinguished officers of foreign navies, and U.S. citizens interested in American seapower. Members pay annual dues which entitle them to a year's subscription to the Institute's monthly professional journal, *The United States Naval Institute Proceedings*, one of the most widely quoted and reprinted journals in the United States.

In addition to the *Proceedings*, the Institute publishes a large variety of books, including works on naval history and biographies of naval heroes as well as texts on professional naval subjects.

Calendar

1969

Monday, 30 June	Class of 1973 enters.
22–24 August	Parents' Open House, Class of 1973.
Monday, 1 September	Labor Day, Holiday.
Wednesday, 3 September	Leave and summer training expire for First, Second, and Third Classes.
Saturday, 6 September	First Semester recitations begin.
5–7 November	Mid-Semester Examinations.
Tuesday, 11 November	Veterans' Day, Holiday.
17–24 November	Registration for Second Semester.
Thursday, 27 November	Thanksgiving Day, Holiday.
Wednesday, 10 December	Graduate Record Examination, First Class.
Saturday, 20 December	Christmas leave begins.

1970

Sunday, 4 January	Christmas leave ends.
16–23 January	Examinations.
23–25 January	Leave.
Monday, 26 January	Second Semester begins.
Sunday, 22 February	Washington's Birthday.
Monday, 23 February	Holiday.
17–19 March	Mid-Semester Examinations.
20–23 March	Spring leave.
Friday, 27 March	Good Friday (no afternoon classes).
Sunday, 29 March	Easter Sunday.
13–20 April	Registration, First Semester 1970–71.
15–23 May	Examinations.
Thursday, 28 May	June Week begins.
Friday, 29 May	Holiday.
Saturday, 30 May	Memorial Day.
Wednesday, 3 June	Graduation.
Wednesday, 24 June	Class of 1974 enters.

Index

Academic Advisory Board, 3, 215
Academic Computing Center, 68
Academic Dean, 4, 60, 217, 223
Academic Departments and Programs, 99
Academic Organization, 60
Academic Program, 57
Accreditation, 1, 57
Administration, 213
Advanced Placement Program, 63
Alternates, Appointment of, 13
Alumni Association, 245
American Republics, Appointment, 14
Application, Congressional Nomination, 10, 16
Application, Presidential Nomina'ion, 10, 17
Application, Son of Disabled Veteran Nomination, 11, 15, 18
Appointment, 10
At-Sea Training, 82, 84, 191, 192
Athletic Association, 205
Athletic Program, 199
Athletics, Intercollegiate, 200
Awards, 245
Bancroft Hall, 7, 73, 89, 93
Basic Curriculum, 57
Board of Visitors, 2, 213
Brigade and Military Program, 73
Calendar, 247
Canal Zone Nominations, 10, 14
Career, Naval Officer's, 47
Chapel, 91
CIC Training Rooms, 155
Civil Service Examinations, 19
College Certificate Method, 23
College Entrance Examination Board Tests, 20
Commandant of Midshipmen, 73, 191, 213, 221
Competitive Nominating Method, 14
Computing Center, Academic, 74
Congressional Nominating Methods, 14
Congressional Nominations, 10
Core Curriculum and Minor, 4, 57
Courses, Engineering, 108
Courses, English, History and Government, 122
Courses, Mathematics, 138
Courses, Modern Languages, 146
Courses, Naval Science, 158
Courses, Professional Training, 192
Courses, Science, 174
Courses, Weapons, 186
Curriculum Changes, Recent, 4
Debate Tournament, Invitational, 67
Degree Requirements, 65
Dental Facilities, 89
Dental Standards, 30
Deposit, Entrance, 37
Director of Athletics, 222, 244
Directory, Staff and Faculty, 217
District of Columbia Nominations, 10
Early Notification of Admission, 34
Educational TV, 68
Electrical and Electronics Laboratories, 170
Eligibility Requirements, General, 9
Engineering Department, 100, 225
English, History and Government, Department 118, 228
Entrance Information and Procedures, 9, 34
Examination Method, 20
Executive Department, 73, 220
Extracurricular Program, 207
Eye Examination, 28
Facilities, 4, 89
Faculty, 1, 60
Finances, 37
First Class Year, 83, 195
First Duty, 48
Foreign Affairs Conference, 3, 66
Foreign Students, 14, 41
Former Midshipmen, 24
Grading, 62
Graduate Study, 52, 66
Guam, Nominations, 10, 14
History, Naval Academy, 1
Honor Concept, 74
Honor Naval Military School, 13
Important Dates, Candidates, 45
Laboratories, Chemistry, 166
Laboratories, Engineering, 102
Laboratories, Language, 143
Laboratories, Naval Science, 155
Laboratories, Science, 166
Laboratories, Weapons, 183

Leaders, Development, 79
Leave and Privileges, 85
Library, Brigade, 68
Library, Naval Academy, 67
Mathematics Department, 134, 231
Medical, Dental, Hospital Services, 89
Medical Examination Consideration, 27
Medical Examining Center Facilities, 31
Medical Qualifications, 24
Michelson Hall, 2, 7
Minors and Majors Program, 64
Modern Languages Department, 143, 234
Museum, 245
Naval Institute, 246
Naval Science Department, 154, 235
Nominating Schedule, 15
Nominations, 10
NROTC Nominations, 13
Oath of Office, 34
Officer Career Patterns, 48
Officer Education and Training, 51
Philippines, Appointment from, 14
Physical Education, 87, 196
Physical Examinations, 24
Physics Laboratories, 169
Planetarium, 155
Plebe Indoctrination, 76
Plebe Year, 76, 81, 192
Prayer, Midshipman's, 93
Preparatory Scholarships, 43
Presidential Nominations, 10
Principal-Alternate Nominations, 14
Prizes, 245
Professional Training Program, 84, 191
Professors Emeriti, 234
Puerto Rico, Nominations, 10, 14
Qualifications Progress Reports, 34
Regular Navy/Marine Corps Nominations, 11
Religious Activities, 91
Reserve Navy/Marine Corps Nominations, 11
Reveille, 78
Rhodes Scholarships, 3, 52
Sailing, 208
Samoan Nominations, 10, 14
Schedule of Instruction, 62
Scholarships, 3, 43, 52
Scholastic Records, 19
Scholastic Requirements, 19
Science Department, 166, 238
Second Class Year, 83, 195
Service Obligation, 40
Ship Hydromechanics Laboratory, 104
Sons of Medal of Honor Winner Nominations, 13
Sports, 200
Staff and Faculty, 217
Superintendent, 1, 60, 217
Tape Recording Studio, 143
Taps, 78
Third Class Year, 82, 192
Trident Scholars, 4, 65
Vice Presidential Nominations, 10, 15
Virgin Islands, Nominations, 10, 15
Weapons Department, 183, 242
Weekends, 85
Weekly Routine, 78
Weight Standards, 27
Wind Tunnel, 102
Yard Patrol Squadron, 155, 210

This catalog should not be considered a contract between the U.S. Naval Academy and any prospective candidate. The curriculum and policies are subject to change to meet varying requirements of the Navy. The Academy's curriculum is currently under revision. While the new basic curriculum will continue to stress military-professional studies, the percentage of electives will be increased, enabling every midshipman to take an elected major.

Graduation —
an end
and a beginning

Photography

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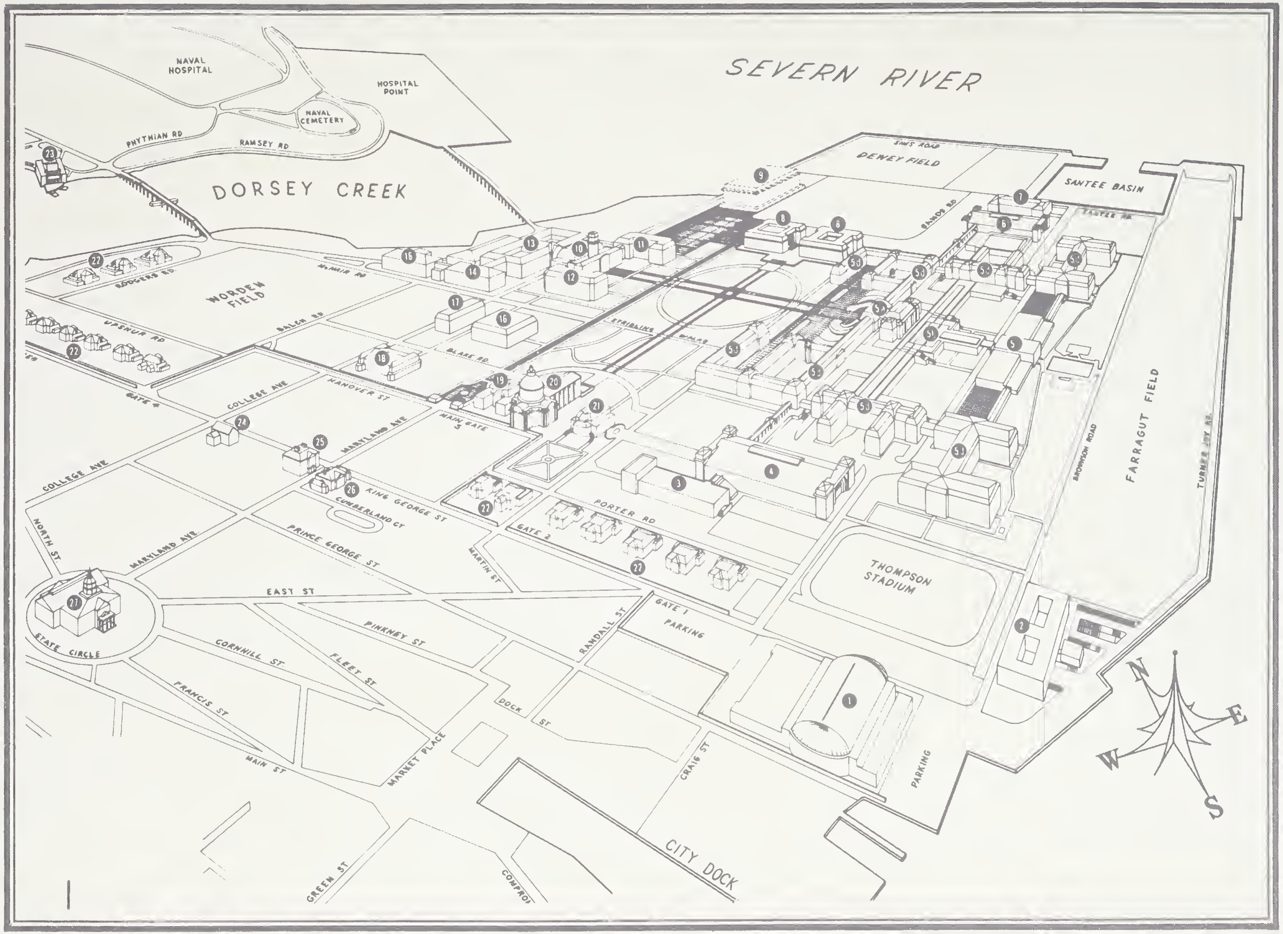
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